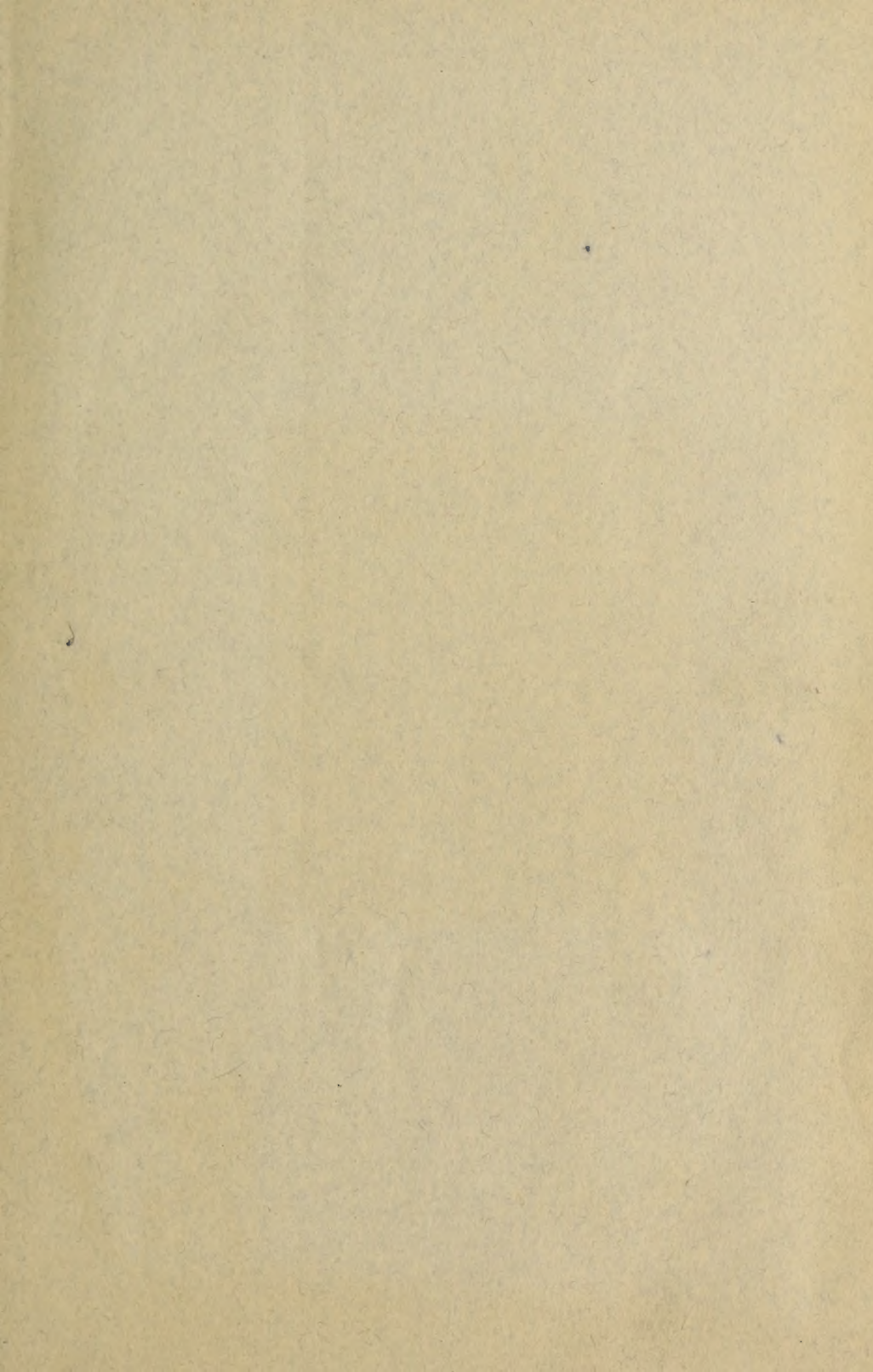




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AMERICAN MUSEUM OF NATURAL HISTORY

Guide Leaflets 13-23

1904-1906

13.       ...                   A General Guide ...
14. Chapman, Frank M.       Birds' Nests and Eggs
15.   *Boad*                   Primitive Art
16. Beutenmüller, Wm.       The Insect-Galls of the Vicinity of  
                                  New York City
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                                  Small Mammals in the American  
                                  Museum of Natural History
18. Matthew, W.D.           The Mounted Skeleton of Brontosaurus  
                                  in the American Museum of Natural  
                                  History
19. Ditmars, Raymond L.     The Reptiles of the Vicinity of New  
                                  York City
20. Ditmars, Raymond L.     The Batrachians of the Vicinity of  
                                  New York City
21. Dahlgren, B.E.           The Development of a Mollusk
22. Chapman, Frank M.       The Birds of the Vicinity of New  
                                  York City
23. Miner, Roy Waldo        A Guide to the Sponge Alcove

SUPPLEMENT TO AMERICAN MUSEUM JOURNAL

VOL. IV, No. 1, JANUARY, 1904

Guide Leaflet No. 13





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AMERICAN MUSEUM OF NATURAL HISTORY

A

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General Guide  
to the  
American Museum  
of  
Natural History



SUPPLEMENT TO AMERICAN MUSEUM JOURNAL

VOL. IV, No. 1, JANUARY, 1904

Guide Leaflet No. 13

# American Museum of Natural History

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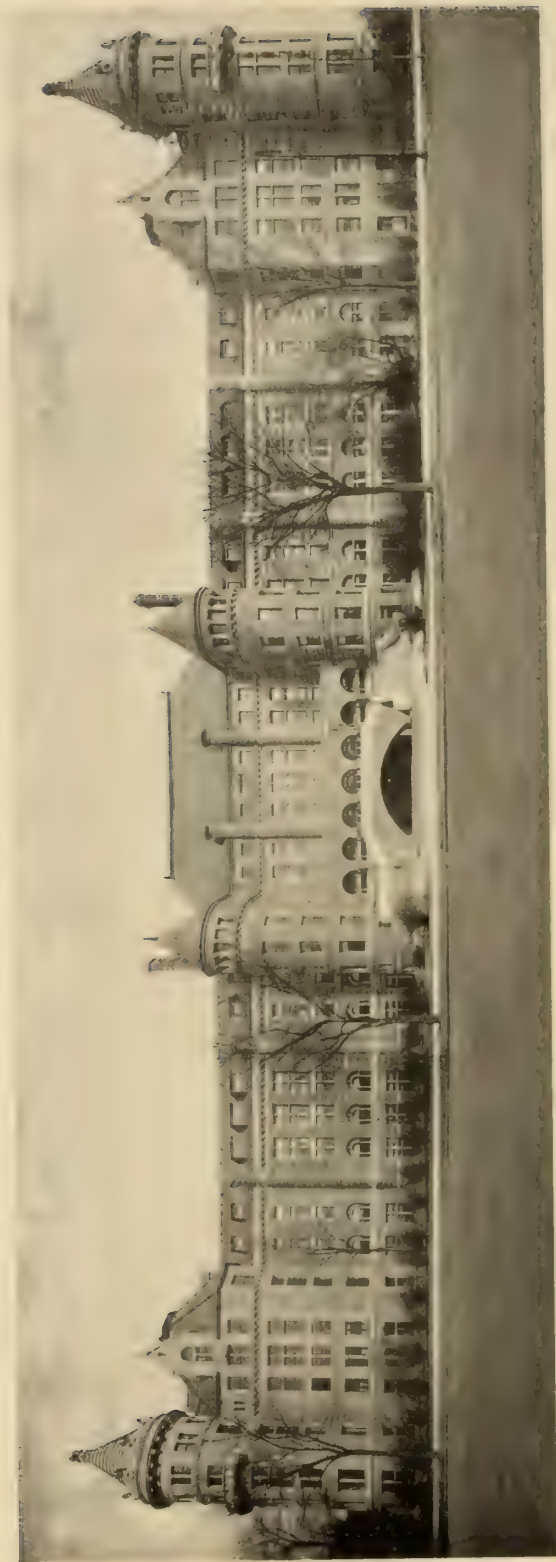
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THE AMERICAN MUSEUM OF NATURAL HISTORY was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people, and it is in cordial coöperation with all similar institutions throughout the world. Since the Museum authorities are dependent upon private subscriptions and the dues from the members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world, the attention of persons interested in such matters is called to the brief statement of deeds and needs on the fourth page of the cover of this Leaflet.

The Museum is open free to the public on Wednesdays, Thursdays, Fridays, Saturdays and Sundays. Admittance is free to Members every day.







THE AMERICAN MUSEUM OF NATURAL HISTORY : SOUTH FAÇADE

*Frontispiece*



A  
GENERAL GUIDE  
TO THE  
AMERICAN MUSEUM  
OF  
NATURAL HISTORY



NEW YORK  
PUBLISHED BY THE MUSEUM AS SUPPLEMENT TO THE AMERICAN  
MUSEUM JOURNAL, VOLUME IV, NO. 1, JANUARY, 1904  
*Guide Leaflet No. 13*



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## HISTORICAL NOTE.

THE American Museum of Natural History dates its official history from April 6, 1869, when the State Legislature at Albany passed an act creating "a body corporate, by the name of 'The American Museum of Natural History,' to be located in the city of New York, for the purpose of establishing and maintaining in said city a Museum and Library of Natural History; of encouraging and developing the study of Natural Science; of advancing the general knowledge of kindred subjects, and to that end of furnishing popular instruction and recreation." This legislation was the outgrowth of an agitation which extended over several years and which finally culminated through the opportunity presented the preceding year (1868) of purchasing the Elliot collection of North American birds and the Maximilian and Verreaux collections of birds and mammals. Among other fundamental collections of the Museum may be mentioned those in entomology presented by Baron R. Osten-Sacken and Mr. Coleman T. Robinson.

The first home of the Museum was in the Arsenal building in Central Park near Sixty-fourth Street, but the building was old and entirely unsuited to the purposes of a great museum and steps were taken at once looking to the erection by the city of a fireproof structure, expressly for the housing and proper exhibition of the collections. That part of Central Park known as Manhattan Square was set apart by statute for the accommodation of the building and on June 2, 1874, President Grant laid the corner-stone of the first section of the great structure which is eventually to occupy the whole of the eighteen-acre plot bounded by Central Park West, West Seventy-seventh Street, Columbus Avenue and West Eighty-first Street. Three years later this wing was opened to the public.

The first president of the institution was Mr. John David Wolfe. His term of office was short, 1869-1871, being terminated by his death only a few months after the opening of the exhibition halls in the old Arsenal building. Mr. Wolfe was succeeded by Mr. Robert L. Stuart, who held the presidency from 1871 to 1881, when failing health compelled him to resign. Two events signalized this period: the occupancy of the first section of the building in Manhattan Square, and the purchase of the James Hall Collection of Geology and Palæontology. The presidency of Mr. Morris K. Jesup began in 1881 and

has seen the Museum develop into an institution of more than national importance and of world-wide influence. During the first year of his incumbency, Mr. Jesup donated the collection of North American Woods and established the Bulletin, a medium for the publication of the scientific work of the institution which is now in its twentieth volume.

Other features of the past twenty-three years have been the establishment of the Department of Public Instruction in 1885 through coöperation with the State; the establishment of the Department of Vertebrate Palæontology in 1891 through Professor Henry F. Osborn; extensive explorations among the ancient ruins of Peru and South America, begun through the generosity of the late Mr. Henry Villard; the presentation by Mr. J. Pierpont Morgan of the Tiffany gem collections and the Bement Mineral Collection; the provision by the Duke of Loubat of the means for the collection and acquisition of the archæological series from Mexico and Central America, and the inauguration of the Jesup North Pacific Expedition. This period, furthermore, has witnessed the erection by the City of the entire imposing south façade of the building as originally projected.

E. O. HOVEY,  
*Editor.*

NOTE.—It is suggested that visitors take the elevator to the top (fifth) floor and then descend from floor to floor at their leisure. Frequent reference to the diagrams will prevent confusion.

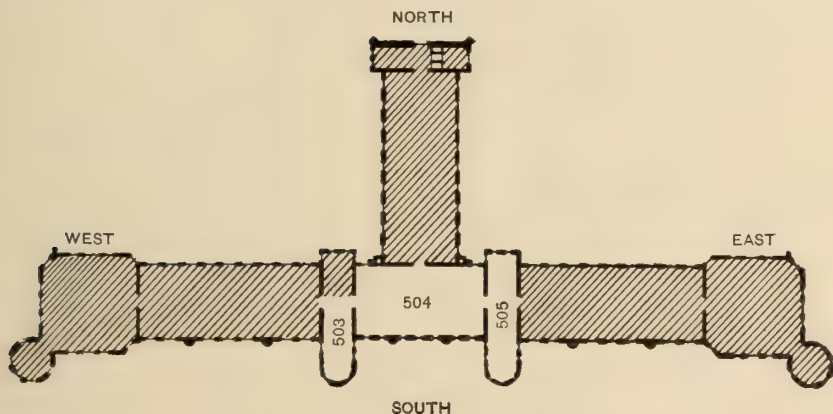




THE READING-ROOM. NO. 503

# GENERAL GUIDE

## FIFTH FLOOR



This floor is largely occupied by offices, laboratories etc., in use by the members of the administrative and scientific staff. (In the diagram these rooms are cross-lined.)

The Shell Hall (No. 504) contains the following collections: A general collection illustrating systematic conchology comprising the combined Jay-Wolfe (1873), Haines (1895) and **Collection of Shells.** Crooke (1893) Collections. The D. Jackson Steward **Collection of Shells.** Collection, presented in 1890, illustrates the Lamarckian system of classification. The material in this hall is fully labeled.

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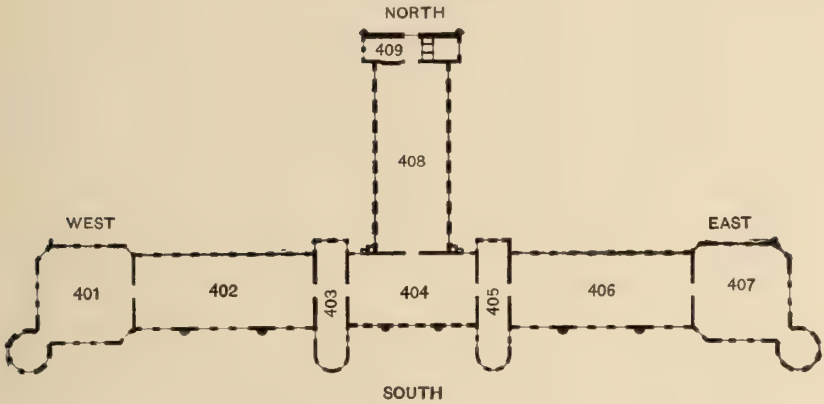
The Museum Library and Reading-Room (No. 503) is entered from the western end of the Shell Hall. Here will be found about 50,000 volumes on natural history sub- **Library and** Library and Reading Room. subjects and a comprehensive selection of the current **Reading Room.** scientific journals. The Library is open to the public.

---

The visitor should now return through the Shell Hall and descend to the floor below.



## FOURTH FLOOR



The visitor now finds himself in the Marine Reptile Corridor (No. 405) on the walls of which are displayed several remarkable fossils. The largest of these is of a Mosasaur, a huge marine lizard, 30 feet in length. On the easterly wall are several Ichthyosaurs; one of these will be seen to be accompanied with young. Fossil Reptiles.

The Anighito meteorite, weighing more than 6,000 pounds, is temporarily installed in this corridor.

Passing now towards the east, one enters the Hall of Fossil Mammals (No. 406). The general arrangement of this hall is on the "alcove plan." The collections of the department include the famous Cope Collection. Along the north side are groups of fossils illustrating among other forms the origin and development of Primitive Hoofed Mammals, Carnivores, Mastodons, Elephants and Even-toed Hoofed Mammals. Along the south side the Titanotheres, Rhinoceroses and Horses receive special treatment. Watercolor restorations show the supposed appearance in life of some of these remarkable animals. The specimens are elaborately labeled and there are special Guide Leaflets, "The Collection of Fossil Vertebrates" and "The Evolution of the Horse," which may be borrowed or purchased of the attendant. Fossil Mammals.





MORGAN HALL OF MINERALOGY. NO. 404

Turning to the west and again passing through the Reptile Corridor one enters a stately room (No. 404) devoted to minerals and in recognition of Mr. J. Pierpont Morgan's many **Mineral** gifts to the Museum named the Morgan Hall. Here **Collection.** are the Bement Collection of minerals and meteorites, certain splendid crystal groups from various donors and the cabinet of the New York Mineralogical Club. There is a special guide for this hall. Copies will be found attached to the cases and they may be purchased of the attendant.

The specimens in the table cases have been arranged strictly in accordance with the sixth edition of Dana's *System of Mineralogy*. The beginning of the series is in the southeast corner of the hall. The Sulphur specimens (Cases 1, F and J) arrest attention on account of their beauty and their strikingly perfect crystallization. Particularly choice are the specimens of Gold (Case 1). The mineral is shown here in sheets like rolled metal; in plates with crystalline edges; in matted filaments consisting of minute octahedra; in grouped octahedra with hollow faces, and in twisted plates attached to quartz. Copper is another native element which occurs in fine crystals (see Case 1). Among the sulphides (Cases 1, 2 and A) Stibnite, the sulphide of antimony, Galenite, the sulphide of lead, and Sphalerite, the sulphide of zinc, are valuable ores and at the same time beautifully crystallized minerals. Pyrite (Cases 2 and C), the sulphide of iron, is a very common species which is prized in every exhibition collection on account of its showy brilliant cubes, dodecahedra and other crystal forms. Fluorite (Cases 3 and 4), Quartz (Cases 4, 5, H, P), the Iron Ores (Cases 6 and 7), Calcite, Malachite and Azurite (Cases 8, 9, 10, I, J), Beryl, including Emerald and Aquamarine (Case 12), Tourmaline (Cases 15, 16 and K), Barite (Cases 23, Q) and Crocoite (Case 24) are among the specialties of the collection which should not escape the notice of the visitor.

This collection, which probably forms the best exhibition series of mineral specimens in the country, is almost entirely the gift of Mr. Morgan.

The Museum collection of meteorites, which is one of the largest in the country, has been placed temporarily in **Meteorites.** Cases 25 and 26. The collection contains many rarities.

The loan collection of the New York Mineralogical Club, containing a large proportion of the minerals which have been found on Manhattan Island and in the immediate vicinity, occupies Case 27. Case 28 (in the northeast corner of the hall) is devoted to several series introductory to the study of mineralogy, such as models of crystal forms and specimens to illustrate the exact meaning of the various descriptive terms used in the science.

To the west lies the Gem Room (No. 403). The gem collection consists of the exhibits made by the Tiffany Company at the Universal Expositions held at Paris in the years 1889 and 1900. It was given to the Museum by Mr. Morgan, who frequently adds to the collection. Especially noteworthy are the series of Corundums (Sapphires), Topazes, Beryls, Garnets and Tourmalines. These show a variety in color and tone that is not generally familiar to the public. Uncut gem materials and crystals are exhibited in connection with the gems. Observe the assemblage of cut and carved semi-precious stones, such as Rhodonite, Jadeite and Jade, and several forms of Quartz, especially Rock-crystal and Amethyst. Several masses of Amethyst are among the most remarkable that have been found. The Morgan Collection of gold coins of the United States is here, containing a nearly complete series of the issues from the Philadelphia mint.

The Copper Queen case exhibits a wonderful series of specimens donated by the Copper Queen Consolidated Mining Company from their mines at Bisbee, Arizona. Note especially the large specimens of "velvet" and ordinary Malachite and Azurite, the green and blue carbonates of copper which for many years formed the sole ores of the mine.

---

Continuing toward the west the visitor next enters the hall of Mexican and Central American Archæology (No. 402), known as the Loubat Hall, on account of the preponderance of material presented to the Museum by the Duke of Loubat.

The key-diagram at the east entrance will assist the visitor in orienting himself in regard to the hall.

The collections have been arranged so as to illustrate the several "cultures" of the region. The word "culture" is used to comprise all the items which go to make up the general life of a people or a race. Filling the eastern portion of the hall are casts and collections, partly from Copan, showing many features of the life of the ancient Mayas, while the west central portion of the room is occupied by the collections from the neighborhood of the City of Mexico which show the culture of the ancient Aztec or Nahua race. The casts of the so-called Calendar or Sacrificial stones are of popular interest, and the ancient codices, or pre-Columbian charts or books, are worthy of special study. Cases illustrating the old Tarascan, Mixtecan-Zapotecan and Costa Rican cultures are in the northwest, southwest and southeast corners of the room respectively. One of the most remarkable single specimens in the room is a life-size terra cotta human figure which was found in a cave near the city of Texcoco, Mexico, and which seems to be the portrait statue of some great war chief of the prehistoric Alcolhuan tribe. The specimen indicates that this ancient people had carried the art of working in clay to a high degree of perfection. The collection is particularly rich in objects made from jadeite, gold and copper, and in ceramics. The major portion of the exhibits in this room consists of casts of the carved stelæ and other stone monuments found throughout the region. Among the most celebrated of these is the huge Turtle Stone. The meaning of the emblems and inscriptions carved upon this and other stones has been but partly determined.

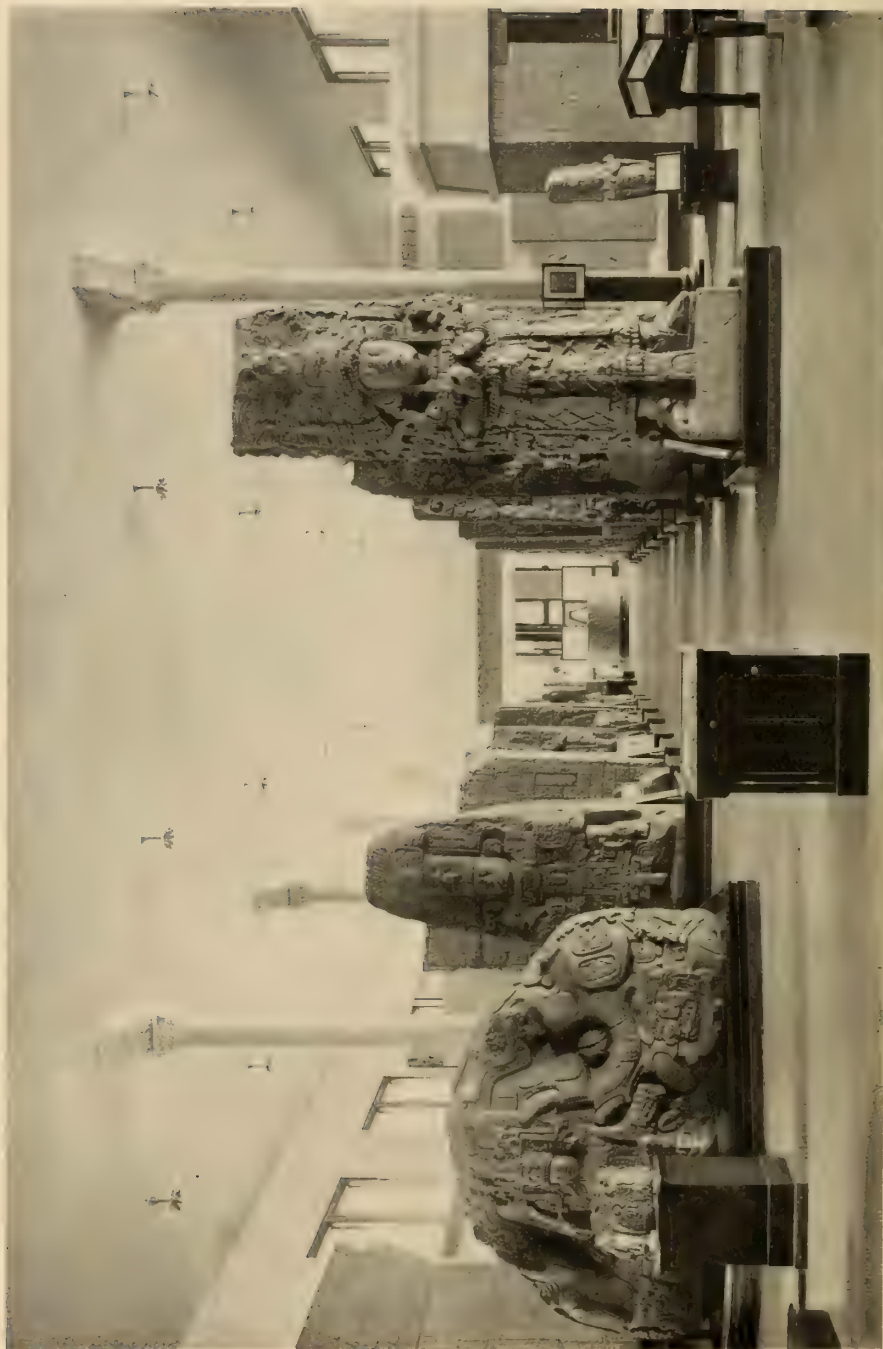
Casts of two stelæ from the ruins of Quirigua, Guatemala, are in Hall No. 202 (second floor), on account of their height.

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Hall No. 401 not yet being open to the public the visitor should retrace his steps, pass to the middle of Morgan Hall and then enter the Hall of Geology (No. 408).

The rocks and fossils displayed in this room illustrate in general the geology of North America and Europe and in particular the geology of New York State. The oldest rocks will be found in the northeast corner and the succession of rocks





and their contained organic remains ("fossils") may be followed by examining the cases along the east, south and west sides respectively. The specimens in the desk cases along the center of the hall correspond as nearly as practicable to the neighboring alcove cases. The classification of the collection is first according to the great sub-divisions of geologic time, then according to geographic provinces and finally according to the principal biologic groups represented. The European fossils are arranged in the northwestern quarter of the hall.

The prominent feature of the collection is the great series of types and figured specimens which it contains. There are here 8,345 such specimens representing 2,721 species and 190 varieties. Three-fourths of these are from rocks of Palæozoic age. The foundation of the whole exhibit is the famous James Hall Collection of fossils and rocks from New York and corresponding western strata which was purchased by the Museum in 1875.

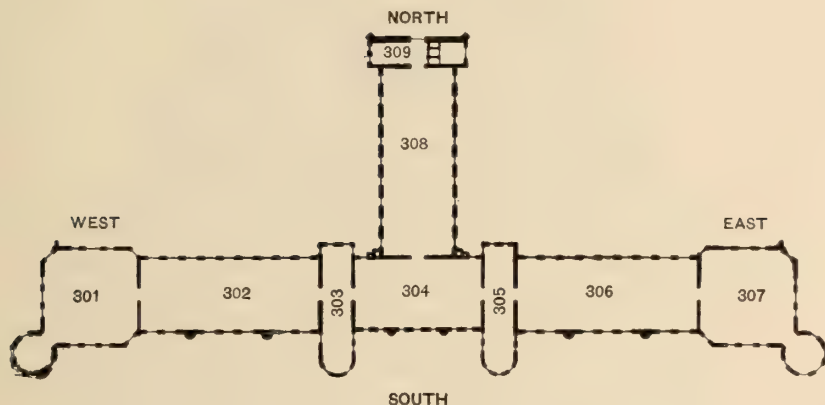
In the northern part of the center of the room the Ward-Coonley Collection of meteorites is temporarily installed. This contains representatives of about 600 falls and finds, and is the largest and most important collection in the country.

---

Returning through the geological and mineralogical halls to the Reptile Corridor (No. 405) we descend to the floor below.



### THIRD FLOOR



The corridor (No. 305) contains the Osprey Group. The birds, nest and accessories forming this group were obtained on Gardiner's Island, where exists the largest colony of Ospreys or Fish Hawks known within 100 miles of New York City.

Turning now to the east the visitor finds himself in Hall No. 306 which is devoted to mammals and insects. The mammals installed in this hall are mostly Old World ungulates, marsupials and edentates. **Mammals.**

The cases along the top of the gallery railing are devoted to insects. At the right (south) is part of the general collection of Butterflies. Silkworm Moths, Cecropia and other moths are directly in front of the entrance. One case contains specimens illustrating the protective coloration of insects. The next case shows protective mimicry. Among the Beetles particular attention will be attracted by the Longhorns or Cerambycidae, the Leafhorns or Scarabæidæ (among which are the Hercules Beetles from the West Indies, Mexico and Africa), the Stag horns or Lucanidæ, and the Sawhorns or Buprestidæ. The last have wing-cases which are remarkable for their green iridescent colors. **Insects.**





TERMITE NEST, THREE FEET HIGH. IN HALL NO. 307

The next hall to the east (No. 307) is devoted entirely to Entomology. At the entrance is a large case containing specimens of Termites' nests from Colombia, Jamaica and the Bahamas. Owing to their resemblance in appearance and in habits to ants, Termites are often incorrectly called "White Ants." They are found in the warmer parts of the world and are both useful and injurious. In uninhabited districts they feed mostly on dead wood, and are the means of clearing the forests of decayed trees.

Insects.

At the north of the entrance is the Jesup Collection of Economic Entomology, illustrating the life history of insects injurious to timber and shade trees. Each exhibit consists of the leaves or other affected parts of the tree, together with the chrysalis, the larva and the adult of the species. Each is accompanied by a descriptive label.

Jesup

Collection.

This hall contains the collection of butterflies of America north of Mexico, and from other parts of the world, which was donated to the Museum by the late Very Rev. E. A. Hoffman. It contains about 2,000 species, represented by more than 5,000 specimens from Mexico, Central and South America, India, Malay Islands, Australia, Japan, Africa and Europe. The North American butterflies are installed in four cases along the west side of the hall, and nearly all the species found in this country are represented. Among the most noteworthy species in the general series of the collection are the Brilliant Blue Morphos, Owl-faced Butterflies (*Caligo*), the Swallowtails (*Papilio*) and the Citron, Orange, Lemon and White Butterflies belonging to the family Pieridæ. A beautiful example of *Papilio homerus* from Jamaica, B. W. I., and one of *Dynastor napoléon* from Rio Janeiro, Brazil, as well as many other rarities, are in the collection.

Hoffman

Butterflies.

The railing-cases of the gallery are filled with a collection of insects from New York City and vicinity. Passing to the left from the entrance the visitor sees in sequence the galls and their insects, the Bees (Hymenoptera), the Dragonflies (Neuroptera), the Grasshoppers (Orthoptera), the Beetles (Coleoptera) in extensive series, and the Butterflies and Moths (Lepidoptera). Guide Leaflets to the Butterflies (No. 7)

Local

Insects.

and to the Hawk Moths (No. 10) have been issued, copies of which may be borrowed or purchased from the attendant.

---

Having now completed his survey of the exhibits in the East Wing the visitor will retrace his steps through Halls No. 307, 306 and 305 and enter the Central Hall (No. 304) where he may continue his study of the collections of mammals and birds.

The main portion of this hall is devoted to the collection of Monkeys, Lemurs, Bats and Rodents. Special popular interest centers around Case C, which is devoted to the group **Mammals.** representing a family of Borneo Orang Utans in the tops of durio trees, and around Case F, which contains the gorilla and the well known chimpanzees which in life went by the names of "Mr. Crowley," "Kitty Banana" and "Chico."

Some small bird groups are here: Scarlet Tanager, Wilson's Phalarope, Red-winged Blackbird, Water Ousel or Dipper.

The case in the southwest corner of this hall contains temporarily specimens of fish and reptiles, including a 24-foot python.

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Visitors are recommended now to pass into the North Wing, Hall No. 308, which is devoted to the Birds of North America.

The upright cases in this hall contain the series of specimens illustrating the bird-life of the continent, arranged according to the generally received classification, which is that of **Birds of North America.** the American Ornithologists' Union. Study of this room should begin at the right of the south entrance. The general order of sequence is that the water birds precede the land birds. There are many groups in this hall showing birds in their natural surroundings, as nearly as practicable. At the south entrance is the group of Coot (Mud Hen) and Yellow-headed Blackbird; then at the right is the large Cobb's Island group showing the bird-life of the beaches of the Virginia coast. Six species of beach-breeding birds are represented. In the alcoves along the right (east) side of the hall are eleven small









In each of the cases the specimens have been installed in order corresponding to the following diagram:

Animals.	Warfare.	
Decorative Art.	Amusement.	House Life (three shelves).
Modes of Personal		
Adornment (two shelves).		Industries (two shelves).
Religious and Other		
Ceremonials (two shelves).		Natural Products and Food.

DIAGRAM SHOWING THE DISPOSITION OF SPECIMENS IN EACH OF THE SYSTEMATIC EXHIBITS  
ILLUSTRATING THE CULTURE OF FOURTEEN LOCALITIES IN ANCIENT SOUTH AMERICA

Many gaps will be observed in these cases, but it is hoped that these will be filled by future acquisitions. Drawings will be found exhibited in connection with the collection which illustrate the manner of use of obscure objects.

In the remainder of the hall the collections have been arranged so as to bring together all the specimens of the same material or character and thus to aid other lines of comparison. **Objects in Metal.** It should be remembered that these collections illustrate a culture that existed in this continent before the advent of the Europeans. One of the special collections contains a choice series of objects made from gold, silver and bronze, among which special attention will be attracted by the cup of beaten gold from Peru, the ornaments of cast gold from Colombia, images of human beings, llamas and other animals in hammered silver and a sea-shell inlaid with parrots cut from sheet silver. Other cases contain a wealth of copper implements. These comprise agricultural implements, bracelets and other personal ornaments, tweezers, battle axes etc. I-clamps of copper used for

fastening together the stones of a building are here. They were found in the prehistoric ruins of Tiahuanaco, Bolivia.

In the large case at the south of the east entrance there is a series of mummies and mummy-bundles illustrating the burial customs of the ancient Peruvians. The next upright **Mummies.** case contains a unique series of skulls showing the various ways of deforming the head practised by the ancient Peruvians, and a still more remarkable series of trepanned skulls from the same region proving a high degree of surgical skill among these ancient people.

Another case displays the collection of musical instruments of the Incas. Guide Leaflet No. 11 describing this remarkable **Musical In-** series is attached to the case for convenience of refer-  
**struments;** ence. It may be purchased of the attendant. The **Pottery.** next case contains pottery representations of animals. These were made by the ancient Peruvians and illustrate more than fifty species. The southwest quarter of the hall contains cases illustrating the ethnology of Panama, Brazil and Paraguay. At the west end is a collection of prehistoric pottery in extensive series arranged according to its geographical distribution.

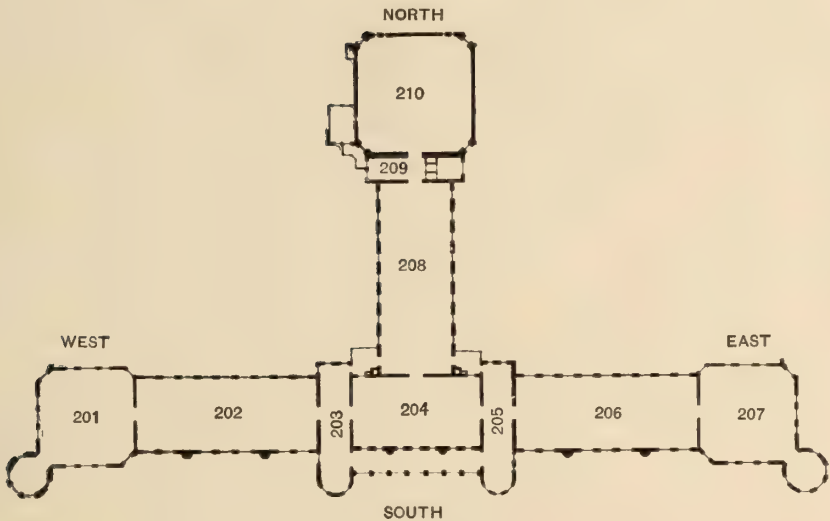
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The corner hall (No. 301) of the West Wing contains the extensive collections made in China with the aid of funds provided by the Committee on East Asiatic Research. This hall is in process of arrangement and is not yet open to the public.

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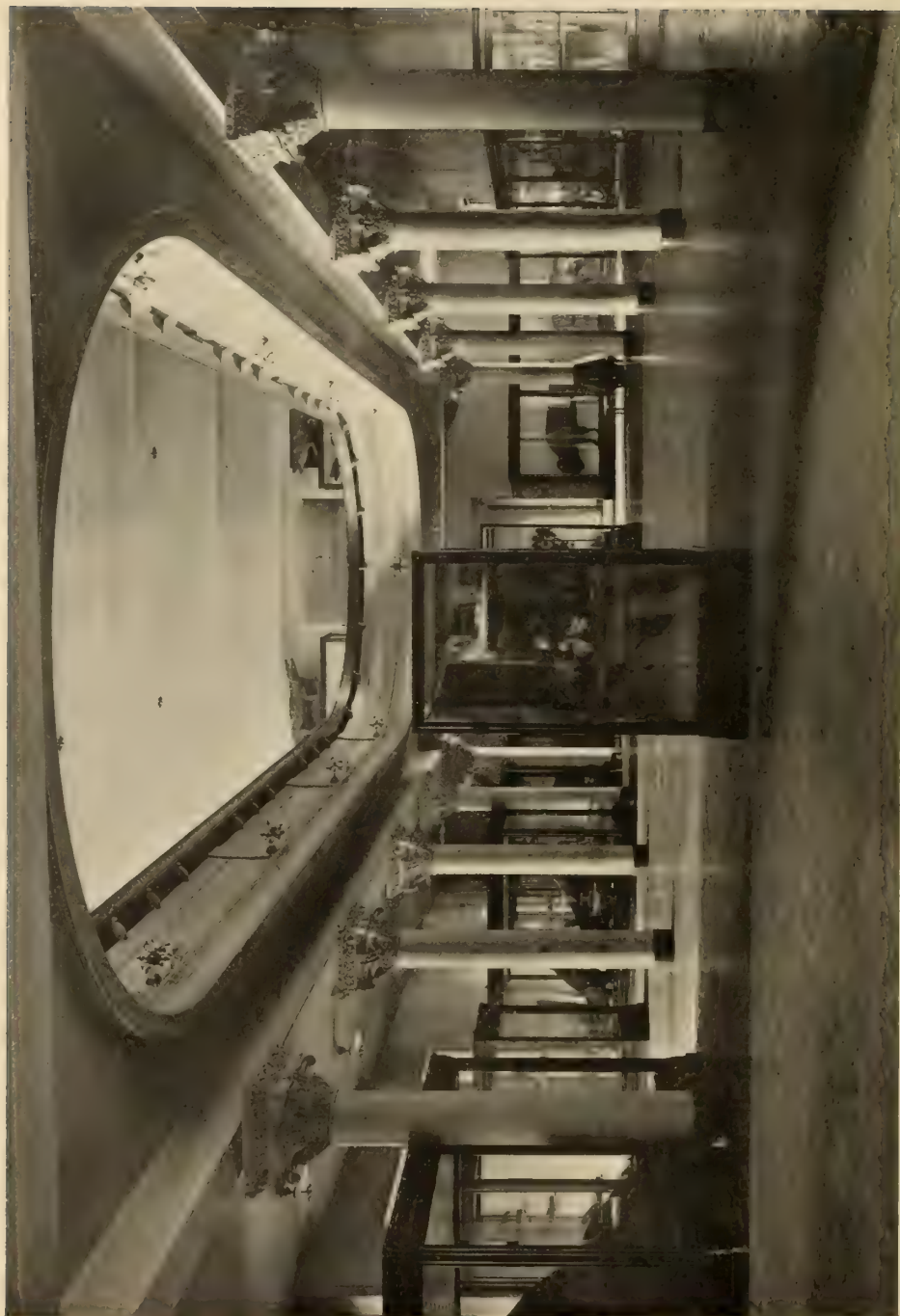
Return to the East Corridor (No. 305) and descend to the floor below. On the walls of the stairway are displayed a series of the antlers of several species of Caribou from the northern portion of the continent. They are typical of four species.

## SECOND FLOOR



In the East Corridor (No. 205) of the second or main floor a fine head of the rather rare African Elephant is to be seen on the wall opposite the elevators. Turning to the east, the visitor finds himself in the Hall of North American Mammals (Hall No. 206). The principal exhibits in this room are the large central groups representing the Moose and the Bison or Buffalo. The Moose group pictures the animal as it is found in the forests of New Brunswick. It is the most elaborate group of its kind exhibited in any Museum. As one item of detail, it may be mentioned that twenty-two thousand artificial leaves enter into its composition. The Bison is one of the animals which man has rendered practically extinct within the last thirty years, hence this group is of especial importance.

Some of the single specimens in this hall are particularly noteworthy, such as: the Walrus collected on the Peary Relief Expedition of 1895, showing a fine bull and a cow, the Elk, the Virginia Deer. The last two in particular are considered excellent examples of modeling. Guide Leaflet No. 5, entitled "North American Ruminants" describes in detail a portion of the collection placed in this hall. It may be borrowed or purchased of the attendant.



MAMMALS AND BIRDS. CENTRAL HALL, NO. 204

The visitor will now turn back from this room and continue his studies in the Central Hall (No. 204). The wall cases are devoted to the general collection of Mammals, and in the lobby are exhibited the skeletons of the elephants "Jumbo" and "Samson" and the mounted skin of the Central Park elephant "Tip." The group of the Spotted Hyena is a life-like representation of that beast of prey. The Fur Seal, the animal supplying the fur for sealskin garments, is represented by excellent specimens.

**Mammals:**  
**General**  
**Collection.**

In this hall there are several bird groups; among them the Brown Pelican, the Duck Hawk, the Red-shouldered Hawk and the Lesser Blue Heron may be mentioned.

The visitor should now pass into the North Wing (Hall No. 208), where he will find the general collection of birds. The series may be studied from the southeast corner as a starting point, where specimens of flightless birds are exhibited.

**Birds.**

The student should pass toward the north along the east side of the room and return along the west side. In general, the water birds come first and then the land species. The Museum collection of birds' eggs is very extensive. The portion on exhibition may be found in the east section of the hall. Among the numerous groups especial attention is called to those representing the Ptarmigan and the Labrador Duck. The Museum series of specimens of the Labrador Duck is one of the features of the collection. It contains seven of the forty-odd known specimens. Among the other great rarities in the collection is the specimen of the Great Auk. Only four such specimens are known to be in this country. The bird became extinct about sixty years ago.

To the north of this hall is the entrance to the gallery of the large Lecture Hall (No. 210).

Retracing his steps through the Central Hall (No. 204), and turning to the west, the visitor finds himself in the West Corridor (No. 203), which contains the collection of mammals found in the vicinity of New York City. These species are represented by groups comprising the Opossum, Raccoon, Red Fox, Woodchuck and fourteen other familiar animals.

**Local**  
**Mammals.**





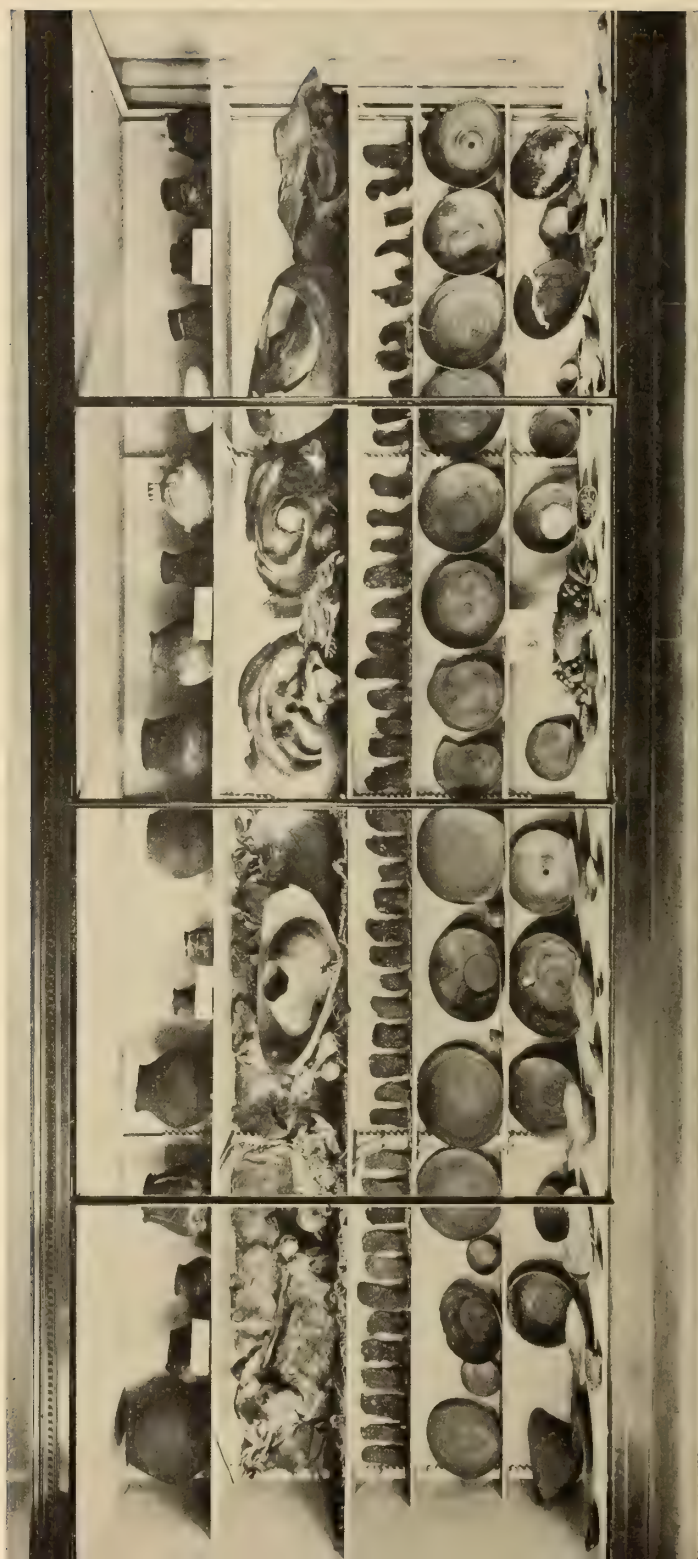
BIRD HALL. NORTH WING, NO. 208

Continuing to the westward, one enters Hall No. 202 of the West Wing. This hall contains the collections illustrating the culture of the Indian tribes of the southwestern part of the United States and of Mexico. The north-eastern portion of the hall is occupied by collections from the Indians of California, tribes particularly interesting on account of their basketry. First come the baskets of the southern and central part of the State. The large wall case beside the entrance contains the larger specimens and also material illustrating the mode of manufacture. The "A" cases contain examples of beautiful weave and design. The Pomo, a tribe living near San Francisco, weave feathers into their baskets; each of the black tufts represents all that is used from a single bird (the Valley Quail). The culture of the Mutsun, the Maidu, the Shasta, the Wintun, the Pit River and the Yurok tribes is shown both by their baskets and by means of their implements of war, hunting and fishing.

Beyond the California exhibit (*i. e.*, towards the west) are the collections showing the cultures of the tribes of Mexico, arranged in the following order: Tepehuane, Tarahumare, Huichol, Cora and Tarasco. It will be noted that the northern tribes, the Tepehuane, the Tarahumare and the Huichol, have been affected less than the southern by Spanish influences.

The region inhabited by the Huichol is comparatively arid, hence most of their religious ceremonies are intended to propitiate the gods of rain, and their ceremonial objects are covered with symbols representing rain. A large series of these objects is on exhibition. Elaborate ceremonies pertain to the pilgrimages after the cactus, from which the drink known as "mescal" is made. These ceremonies are illustrated by many specimens. The Huichol are skilful weavers, and the collection shows many samples of their work. A group shows the methods employed by this tribe in making arrows and cloth.

The other tribes of southern Mexico and Guatemala (see the cases in the northwest corner of the hall) show the survival of pre-Columbian culture in their sacrificial jars, masks and other objects, most of which pertain to ceremonial rites.



CULTURE OF THE BASKET-MAKERS OF SOUTHEASTERN UTAH. A CASE IN HALL NO. 202

The south side of the hall is devoted to the collections showing the culture of the tribes of the pueblos of New Mexico and Arizona and the cliff-dwellings of Colorado and Utah. Some of these peoples are now extinct, others still survive. At the entrance (east) is a large series of the various kinds of pottery from the pueblos. Here too is a Navajo blanket in process of weaving. A neighboring case exhibits, by means of raw and prepared materials, tools and photographs, the methods employed by the Pueblo in making pottery and cloth. The manner of preparing native colors and dyes forms a part of this exhibit. In the next upright case, the Hopi "katchinas," or dolls, and "the trousseau of a bride" give further hints as to the life in the modern pueblos.

**The Pueblo  
and the  
Cliff-  
Dwellers.**

Pueblo Bonito, a prehistoric ruin in the Chaco Cañon, New Mexico, has furnished through the Hyde Expedition a wonderful array of choice objects. These have been installed in the center of this side of the hall, and include chalcedony and obsidian arrow points; stone implements of many kinds; bone needles, awls, bodkins and chisels; pottery bowls, pitchers and jars; turquoise beads, pendants and figures, to the number of more than fifty thousand; arrows, spears and axes. A series of flutes shows that these ancient people were cultivated in music. Carved sticks were used in some ceremonies in the same pueblo.

**Pueblo  
Bonito.**

Other pueblos and the cliff-dwellings have furnished through the same expedition a wealth of material showing the advanced culture of their prehistoric inhabitants. One case shows all kinds of ancient sandals, and exhibits by means of specimens the mode of manufacture and the manner of wearing. A prehistoric cotton blanket is on exhibition, together with the ancient implements of weaving.

A Guide Leaflet, entitled "The Basket Makers of Southeastern Utah," describes in some detail the unique collection in the large case in the southwestern corner of the hall. This leaflet may be found attached to the case, or the visitor can purchase it from the attendant.

The William Demuth Collection of pipes shows the manner of use of smoking-tobacco in many parts of the world.



On account of their height, the casts of two stelæ from the ruins of Quirigua, Guatemala, have been installed in this hall instead of in Hall No. 402.

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Beyond this hall one passes into the corner hall of the West Wing (No. 201), which contains extensive collections of the antiquities of the central and eastern parts of North America. The specimens are arranged according to the localities where they were found, those from the northern region being on the north side of the hall; from the eastern, on the east side, etc. The antiquities from Manhattan Island and the vicinity of New York City, a model of an Ohio mound and a cache of 4,800 chipped objects from Illinois (probably constituting a prehistoric arsenal) are of special interest. There is an extensive exhibit of the artifacts and human bones which have been found in the terraces along the Delaware River, near Trenton, N. J., in the course of investigations carried on during many years by the Museum. These remains are thought to indicate that man was in existence upon this continent at the close of or during the later stages of the Glacial Epoch. There is a Guide Leaflet to the "Saginaw Valley Collection," which may be borrowed or purchased of the attendant.

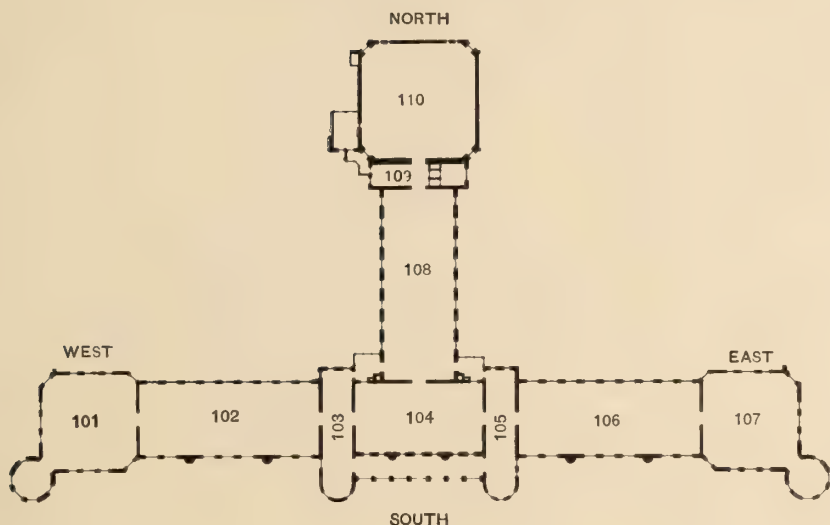
In the Tower Room are displayed types of prehistoric implements, forming the Andrew E. Douglass Collection, which was presented to the Museum in 1900.

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Going back again to the East Corridor (No. 205), the visitor will descend to the ground floor of the building and there complete his survey of the Museum.



## FIRST FLOOR



Turning as before to the east, one enters the first hall of the East Wing (No. 106), which is devoted to the exhibit of North American Forestry. At the entrance of the hall, there has been placed a key-diagram giving the plan of arrangement of the collection, which should be consulted by the student.

The exhibit consists of the Jesup Collection of Trees of North America, which is the most complete collection of the kind in any museum. The specimens are elaborately labeled and are accompanied by water-color sketches of leaves, flowers and fruit. Small maps show the geographical distribution of each species. The general scheme of arrangement is that conifers, chestnuts, oaks etc., are on the north side of the hall, while walnuts, maples, ebony, mahogany etc., are on the south side. The collection was presented to the Museum by its president, Morris K. Jesup, Esq.

For lack of space here, two important wood specimens have been placed in the next hall.



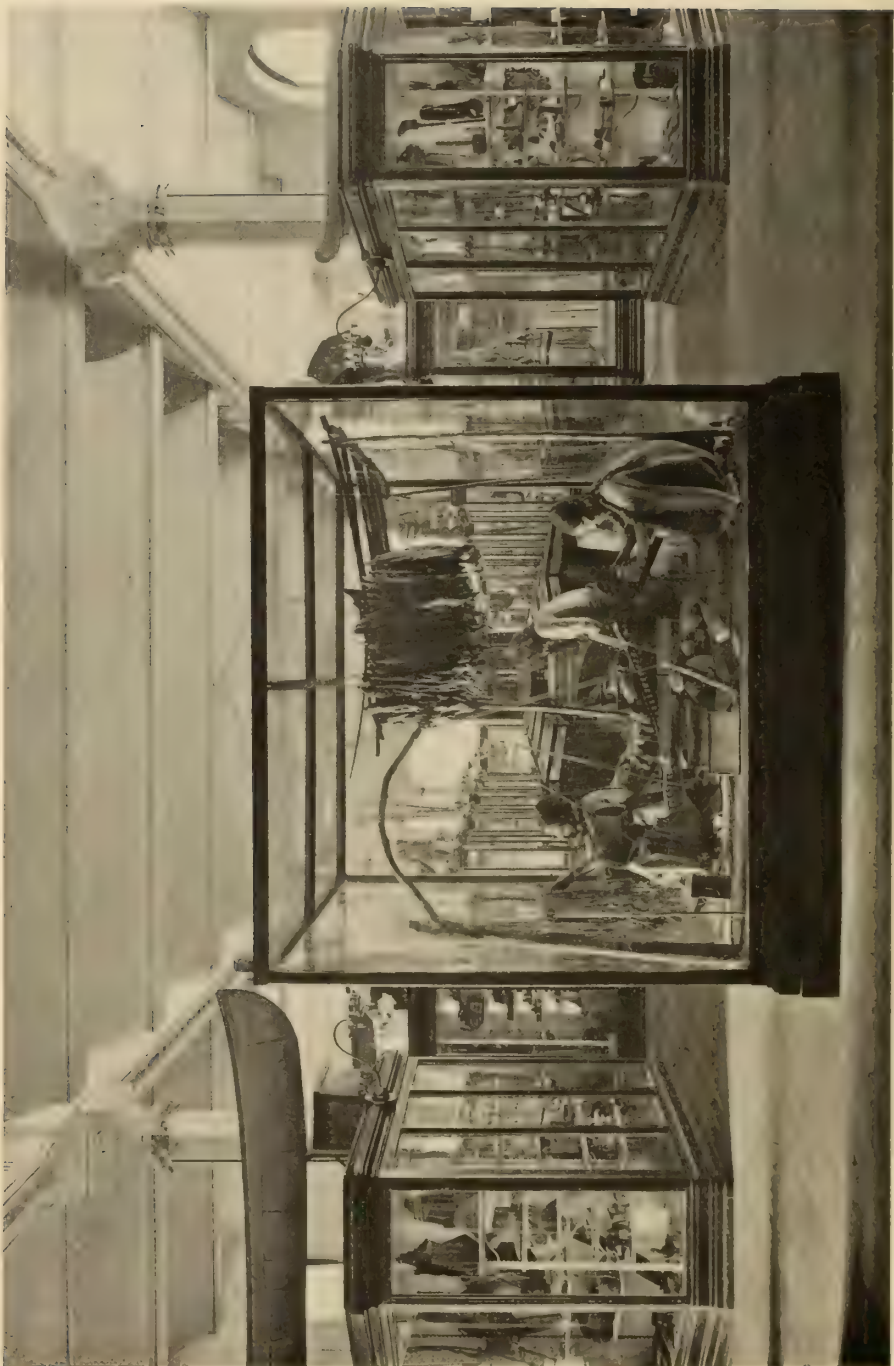
NORTH AMERICAN FORESTRY. HALL NO. 106

Beyond the Wood Hall is the Hall of Invertebrate Zoölogy (No. 107). On the north of the entrance is a section of California redwood, and on the south a section of the Sequoia or "Big Tree," 16 ft. 8 in. in diameter. A Guide Leaflet entitled "The Sequoia" may be borrowed or purchased from the attendant. Big Tree.

The key-diagram at the entrance of the hall enables the visitor to comprehend at a glance the arrangement of the collections. The "alcove" plan has been followed strictly in the disposition of cases around the outer portion of the hall. These alcoves contain the synoptic collection of invertebrates, and by beginning in the northwest corner and going from left to right around the hall one passes from the lowest to the highest forms of animal life. The exhibition of microscopical animals, in Alcove I, will warrant careful examination. The Sponges in Alcove II have exquisite beauty. In Alcove III are excellent models of living coral-forming animals. Special exhibits have been placed in the center of the hall. Among the most interesting specimens are the models of the Giant Squid and Octopus, two large corals, models of the development of *Crepidula* egg, and an exhibit showing the life history of Mosquitoes and their relation to malaria. On the south wall hangs a specimen of the Giant Spider Crab from Japan. Invertebrate Zoölogy.

The Tower Room, opening out of this hall, contains a special exhibit of stony corals, largely the gift of Mr. Percy R. Pyne.

The visitor will now retrace his steps through the Wood Hall to the East Corridor (No. 105), where he will find displayed the Jesup Collection of Building Stones. The main portion of this series consists of four-inch cubes duplicating the collection made for the United States National Museum in connection with the Tenth Census. The specimens are arranged geographically according to the States from which they came, and under each head they follow the same grouping, granites and other crystalline rocks, sandstones, limestones and marbles being placed together. The eight-inch cubes on the tops of four of the cases form an exhibit of the various building stones occurring in Georgia. Jesup Building Stones.



ETHNOLOGY OF THE NORTHWEST COAST OF AMERICA. HALL NO. 108



From the East Corridor pass to the North Wing (Hall No. 108). The visitor, on entering this hall, should first consult the key-diagram, from the map accompanying which he will note that the hall contains material illustrating the tribes of the northwestern coast of America and the contiguous plateau region. The collections from the coast tribes have been installed in two series:

*First.* A general or synoptic collection of specimens obtained from the entire area, designed to illustrate the culture of the people as a whole;

*Second.* Several independent collections, each illustrating the peculiarities of the culture of a single tribe.

The collection forming the first series occupies three alcoves on the north side of the hall. This collection shows:

(a) Natural products that are of economic value: the vegetable kingdom furnishes food and material for manufactures; the multitude of objects made from the cedar, such as blankets, baskets, ropes, boxes, canoes, illustrate the importance of this tree; the animal kingdom provides fish for food, horn for manufacture into spoons, skin for blankets, wool for weaving, shell for ladles, bone for tools, porcupine-quills for purposes of ornament; the mineral kingdom furnishes material for axes, hammers, scrapers and other tools.

(b) The industries of the people, as illustrated by their work in stone: pecked hammers and mortars and polished knives and ornaments; their work in wood, splitting and planing, bent-work, carving; their weaving, —baskets, mats and clothing; their painting, rope-making and modern metal-work.

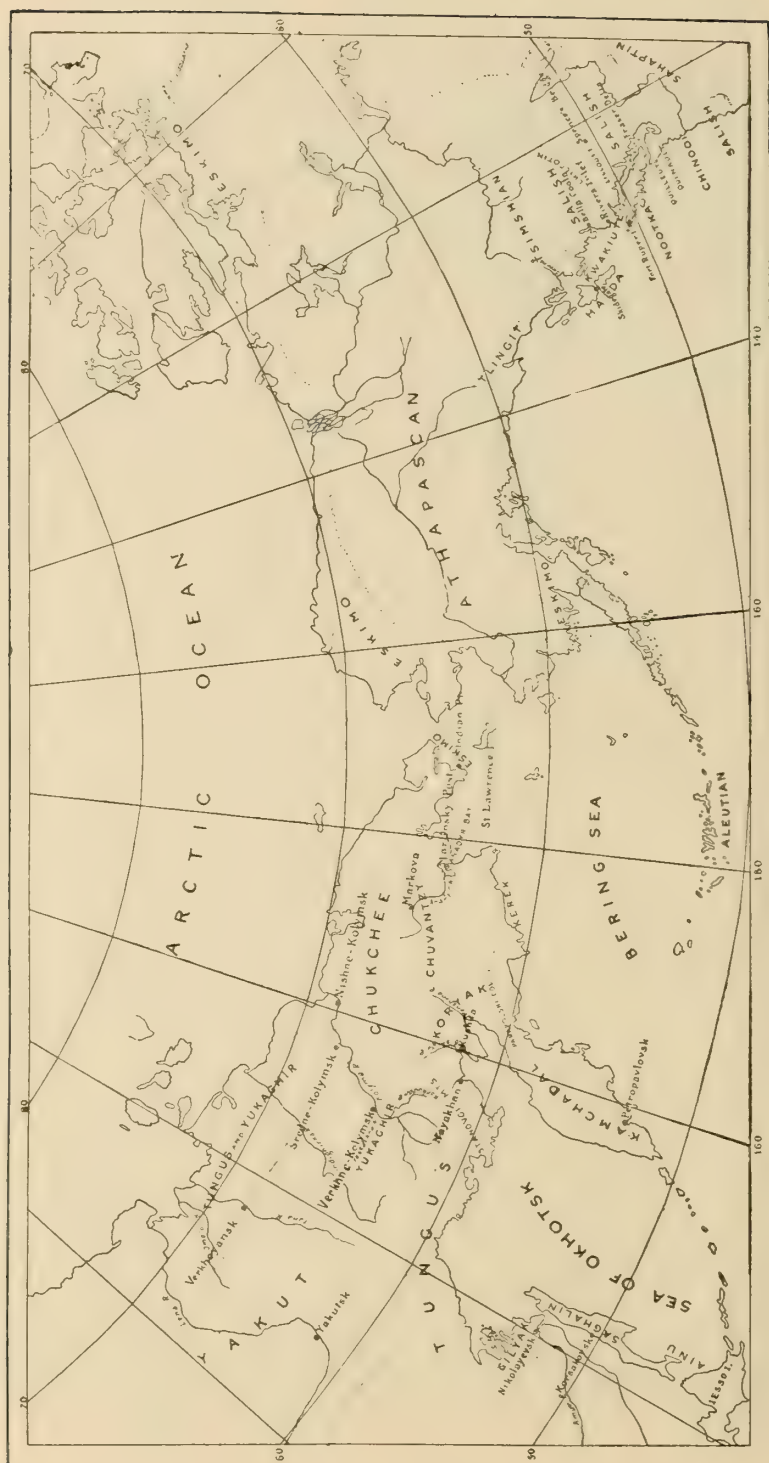
(c) House-furnishings,—principally boxes, dishes and baskets,—of which there are several examples in Alcove 2.

(d) Dress and ornament, illustrated by life-sized figures, some of which show the custom of wearing labrets and nose-rings.

(e) Trade and barter, —copper plates used as standards of value, and articles that have been imported from the tribes of the interior, from the Eskimo and indirectly from more distant countries.

(f) Hunting and fishing, —bows and arrows, spears, fish-hooks,





DISTRIBUTION OF TRIBES INVESTIGATED BY THE JESUP NORTH PACIFIC EXPEDITION. SEE HALLS NO. 108, 102, 101

lines, nets and traps. A special exhibit of traps (in Case S) supplements the material in Alcove 2.

(g) Travel and transportation, -canoes, snow-shoes, climbing-apparatus etc.

(h) Armor and weapons (entrance to Alcove 3), —a number of pieces of armor made of slats and rods which are especially characteristic of these people; bone and iron daggers, stone clubs.

(i) Musical instruments (Alcove 3), flutes, whistles, rattles and a cedar-box drum.

(j) Decorative art (Alcove 3). The specimens here exhibited show that, in their decorative art, the people employ somewhat realistic animal motives, the form of the animal body being dissected and distorted so as to fit the decorative field.

(l) Clan organization (entrance to Alcove 4),—models of totem poles bearing carvings of the crests and other symbolic designs of the family or clan. These are at the same time illustrative of the art of the people.

The collections of the second series —*i. e.*, the collections illustrating the culture of each individual tribe—commence in Alcove 4 with those from the Tlingit and extend around the northern half of the hall in the order of the geographical succession of the tribes from north to south, thus (consult the map in the key-diagram near the south entrance of the hall; see also page 42):

The TLINGIT (Southern Alaska), Alcoves 4, 5, 6.

The TSIMSHIAN and the HAIDA (Northern British Columbia), Alcoves 6, 7, Center Case 20.

The BELLA COOLA (Central British Columbia), Alcoves 8, 9.

The KWAKIUTL (Northern Vancouver Island), Alcoves 9-12.

The NOOTKA (Southern Vancouver Island), Alcoves 12, 13.

THE COAST SALISH (Vancouver Island and Washington), Alcove 13.

The PLATEAU TRIBES (British Columbia and Washington), Alcoves 14, 15, 16.

Archæological material from the whole region is exhibited in the desk cases along the middle of the hall.

On the whole, the special collections are arranged in the same order as the general synoptic collection illustrating the culture of the coast tribes. The collections from the **Tlingit** of southern Alaska (Alcoves 4, 5, 6) are remarkable particularly on account of the great number of excellent old pieces of superior workmanship. The numerous masks from this region were used by the shamans in their ceremonies and represent their individual protectors.

In the collections from the Tsimshian and Haida of northern British Columbia (Alcoves 6 and 7 and Center Case 20) paintings and models of totem-poles will be found, which illustrate fully the use of the crest and the representation of family traditions on the carvings of these people. Their masks are also used in festivals celebrated by the various families.

The collections from the Bella Coola of central British Columbia (Alcoves 8 and 9 at north end of hall) contain a full set of ceremonial masks illustrating all the important deities of the tribe, chief of which is the Sun.

A very full collection from the Kwakiutl of Vancouver Island is found in Alcoves 9-12. The peculiarities of their industries are illustrated by numerous specimens. Many of the masks (Alcove 11) are used in pantomimic representations of the traditional history of the families; while others, together with neck-rings and head-rings of cedar-bark, belong to the ceremonials of their secret societies, particularly to those of the Cannibal Society (Alcove 12).

Next in order come the collections from the Nootka (Alcoves 12 and 13), whose industries and customs are similar to those of the Kwakiutl. The masks and carvings which they use, however, are much ruder than those of the northern tribes. This is the only tribe that hunts the whale. Their whaling-harpoons are exhibited in Case S at the south end of the hall.

On the south side of Alcove 13 are found collections from the Coast tribes of the State of Washington (Coast Salish). The culture of this region shows a gradual transition to that of the tribes of the interior. Here we find basketry highly developed.

The material in Alcove 14 is so arranged as to bring out as strongly as possible the contrast between the culture of the coast and that of the interior. The cases contain excellent basketry, and garments made of skin decorated with painted geometrical designs and with pictographic representations. Here we also find specimens illustrating the use of the horse. The clothing exhibited in Alcove 15 shows the close affiliations of this culture with that of the Plains Indians. The garments are made of skin decorated with feathers, painted and embroidered. The similarity of culture with the eastern Indians is still greater among the Plateau tribes near the Columbia River (Alcove 16). Here we notice painted hide bags, embroidered blankets and bead-work quite similar to that of the eastern Indians. The tribes of this district also excel in basketry similar in type to that of the interior of British Columbia.

The contrast between the occupations and the dress of the coast tribes and those of the interior is brought out in three groups in the middle of the hall.

The desk cases along the center of the hall contain archæological collections. The southern cases exhibit material from the plateau region, while the northern cases contain material from the coast region. It seems that, on the whole, the culture of the prehistoric tribes has been the same as that of the present tribes.

**Archæo-  
logical  
Material.**

Most of the material in this hall was obtained by the Jesup North Pacific Expedition.

From the north end of Hall No. 108 one passes through the North Corridor (No. 109) into the Lecture Hall (main floor). This is the center of great activity during the fall, winter and spring months. Regular courses of lectures are given on Thursday evenings by members of the scientific staff to Members of the Museum, on Saturday mornings to the teachers in the public schools (in co-operation with the State Department of Public Instruction), on Tuesday and Saturday evenings to the general public (in co-operation with the City Board of Education), and on other occasions as need arises. About ninety lectures are delivered in the course of the season.

**Lecture  
Hall.**



The hall is 100 feet square and can seat an audience of 1,500 people. It is provided with two screens, each 25 feet square, and the illustrations for the lectures are projected by means of two double electric stereopticons.

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Leaving Hall No. 108 at the south end we pass to the West Corridor (No. 103). Here, extending upward through three stories of the building, is a Haida totem-pole, 52 feet tall, from Queen Charlotte Island.

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Continuing toward the west, North American Hall (Hall No. 102) is entered next. The collections in the south side of this **North American Hall.** hall represent in sequence the cultures of the Indians of the Plains, of the Eastern Woodlands and of part of the Southwest. The visitor is recommended to begin here in continuation of the studies which he has made in the North Wing (No. 108).

The collections from the Plains Indians have largely been made from the point of view of illustrating their decorative art **The Plains Indians.** and their ceremonials. The first case on the south side (Case 17) contains material from the Blackfoot. This is followed by collections from the Cheyenne (Case 18), Arapaho (Cases 18-21), Gros Ventre (Cases 21, 22), Sioux (Cases 23-26), Shoshone (Cases 27-28), and Ute (Case 29),—all representatives of the Plains culture.

These tribes originally subsisted on the buffalo, and consequently most of their utensils pertain to the preparation of skins and to the manufacture of implements of bone (Case 19). The present ceremonials of the Plains tribes are much modified by the teachings of recent Indian prophets, which have taken the form of the so-called "Ghost dance," the paraphernalia of which are exhibited in Cases 19 and 20. Bags containing certain sacred objects are much used. Such a sacred bag is in a case in the center of the hall. Among many tribes there exist societies grouped according to ages, which perform ceremonial dances, each with separate paraphernalia; the objects pertaining to four such dances are shown in the wall-case, south side of hall.

The significance of the peculiar geometrical ornamentation employed by the Plains Indians is illustrated (Case 20) as found among the Arapaho. The Gros Ventre (Cases 21, 22) are closely related to the Arapaho. In the collection from the Sioux, a number of war-clubs and bows and arrows will be found (Case 23). Saddles, quirts and saddle-bags illustrate the extended use of the horse, which has so much influenced the life of the Plains Indians since its introduction. The "horse travois" in Case 23 shows a means of transportation. The pictographic symbolism and the decorative art of the Sioux are illustrated by many shields and garments. The industries and decorative art of the Shoshone and of the closely related tribes of the Bannock and Ute are exhibited in Cases 27-29.

The great ceremonial known as the Sun dance, which is so characteristic of many of the Plains tribes, is illustrated by a group in the center of the hall.

The culture of the Indians of the Eastern Woodlands is shown in Cases 29-31. The life of these tribes has been very much influenced by contact with the whites; but in a few districts some of the old industries still survive. The pouches (Case 28) and the mats (Case 29) from the Sauk and Fox probably represent the ancient type of ornamentation of this district. These Indians practise agriculture, and in some regions live on wild rice. Agricultural tools and products are shown in Cases 30 and 31.

Adjoining these people to the north live the Athapascan of the Mackenzie area, who subsist on hunting and fishing, and whose present industries have been highly modified through contact with the Hudson Bay Company (Case 33).

The Indians of part of the Southwest are illustrated in the long wall-case on the south side of the hall by a collection of basketry of tribes in Arizona: the Apache, Pima and Papago.

The visitor is advised to return now to the east end of the hall, and to begin an inspection of the collections in the northern half. These represent the cultures of the Eskimo tribes from Greenland to Siberia and those of the Ainu and some of the tribes dwelling along the Amur River.



ESKIMO WOMAN, WEST COAST OF HUDSON BAY. HALL NO. 102

The wall-case at the entrance and Cases 1 and 2 contain a comparative series illustrating the uniformity of the cultures of the Eskimo of the whole area, extending even to the Chukchee of northeastern Siberia.

The collections from Smith Sound (Cases 1 and 3) show that the objects made by the tribe of Eskimo living here are very rude in form. Along the west coast of Baffin Bay a greater variety of objects and tools is used (Cases 3 and 4), partly owing to the greater abundance of drift-wood. The natives of this region use whaling-lances (Case 4), and have ceremonials in which masks are used.

The Eskimo of Southampton Island have had very little contact with Europeans; consequently we find here (Case 5) stone-tipped arrows and harpoons, toboggans made of whalebone, implements for chipping stone, and other very primitive objects. Wherever steatite, or soapstone, occurs, the Eskimo make lamps and pots out of it, but in the limestone area of Southampton Island, in Hudson Bay, where no steatite is available, lamps and pots are made by cementing together slabs of limestone (Case 4).

The tools and implements of the Eskimo of the west coast of Hudson Bay (Cases 5, 6, 7) are more varied, partly because musk-ox horn and a rather plentiful supply of wood are available for manufactures, partly on account of the influence of the neighboring Indian tribes.

There is a decided change in the type of culture west of Mackenzie River. The implements of the Eskimo of this area, which includes Alaska, are much more complex than those of the other tribes, and there is a strong tendency to decoration which is absent among the eastern Eskimo. We find here highly differentiated forms of harpoons (Case 7), ivory objects with pictographic representations (Case 8), stone implements and stone ornaments of varying form, and harpoons with property-marks (Case 9), coiled and woven basketry and a great variety of masks (Case 10). The culture of the Eskimo of Siberia (Case 11) is practically identical with that of the Eskimo of Alaska.



The remainder of the hall is taken up with collections from southeastern Siberia.

Cases 12 and 13 contain material from the Ainu of Yezo and Saghalin. Many of the objects exhibited in these cases show a strong influence of Japanese culture, while others show that the culture of the Ainu resembles that of other Siberian tribes. We find here simple basketry, clothing woven of nettle-fibre, carved wooden dishes and many objects used in ceremonials connected with the bear-hunt.

**The Ainu.**

The tribes of the Amur River region (Cases 13-16) are highly influenced by their neighbors the Chinese. They live principally on salmon, and their garments are largely made of salmon-skins, but elk-hide is also used (Cases 13-15). More recently garments with silk embroidery and appliqué-work have been used. The characteristics of their patterns are scrolls, which are worked out in the forms of roosters and fishes (see particularly turn-stand on wall on north side of hall). Similar work is done in wood-carving and birch-bark (Case 16). Among these tribes the bear-hunt is connected with many ceremonials in connection with which beautiful inlaid lances are used (Case 16). In the treatment of the sick, crude carved amulets representing the spirits of diseases are used (Case 16). Their canoes, which are partly covered on top, have long ends projecting under the water (case in middle of hall). Models of the houses, sledges and boats of the Amur tribes are exhibited in the wall-case at the west end of the hall.

**Tribes of  
the Amur  
River.**

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Leaving the North American Hall at the western end, the visitor finds himself in Hall 101 of the West Wing. This hall is filled with the Siberian collections obtained by the Jesup North Pacific Expedition. These form the most complete exhibit of the culture of that region in existence.

**The Siberian Hall.**

The tribes represented in the hall are, beginning at the right of the entrance (consult also the map on page 42):

The CHUKCHEE (Coast of Bering Sea and inland), Cases 1-5;

The KORYAK (Coast of Bering Sea and inland), Cases 6-9;

The KAMCHADAL (Peninsula of Kamchatka), Case 9;

The YUKAGHIR (Basin of Kolyma River), Cases 10, 11;

The TUNGUS (Coast of Sea of Okhotsk), Cases 12-15;

The YAKUT (Basin of the Lena River), Cases 15-18.

One section of the Chukchee and Koryak inhabits maritime villages and subsists by hunting sea-mammals, while another section of the tribes dwells in the interior and lives upon the produce of reindeer-breeding. The customs of these two divisions of the tribes are very much alike.

The clothing worn by the Chukchee is illustrated in Case 1, beside the entrance. The skins of reindeer and of seals are used for both winter and summer garments. Household utensils, such as stone lamps, kettles and spoons, and implements for various industries, such as skin-dressing and work in bone and wood are shown in Case 2. Snowshoes and snow-sticks indicate the mode of travel.

Harness and other articles (Cases 2 and 3) show the use of dogs and reindeer as draught-animals. On the west side of Case 3 are objects used in hunting the whale and other sea-mammals. Case 4 contains bows and arrows and suits of armor. The armor evidently was made in imitation of that of the Japanese. Amulets and sacred fire-drills are used in the ceremonials of the Chukchee. The adjoining "A" cases contain pictographic representations (many of which are used in prayers), wooden and ivory carvings, ornaments and pipes.

Models of various types of sledges of the Koryak and Chukchee are exhibited in Case 5.

The clothing of the Koryak (Case 6) is much more elaborately decorated than that of the Chukchee. The decoration is partly in embroidery, partly in skin mosaics. Their pictographic representations and their carvings in bone, ivory and horn are shown in the adjoining "A" cases.

The Koryak are the only tribe of eastern Siberia possessing a well-developed iron industry. Tools and manufactured objects of iron will be found in Case 7, in which there are also objects of pottery quite similar in type to that of Alaska. Among the Koryak industries, basketry deserves particular mention (Case 7). Their weapons and the style of their armor are quite similar to those of the Chukchee (Case 8). In their festivals, many of



CHUKCHEE MAN, EASTERN SIBERIA. HALL NO. 101

which pertain to the hunt of the whale, elaborately decorated garments are worn, and masks made of grass and of wood are used (Case 8). On the north side of Case 9 are shown garments in which the body of a dead person is dressed when it is placed on the pyre to be burned.

The south side of Case 9 contains basketry and birch-bark objects from the Kamchadal, a collection of particular value because the primitive culture of this Kamchatka tribe is **The Kamchadal.** practically extinct.

The Yukaghir live farther to the west. Specimens from the tribe are contained in Cases 10 and 11 and in the small case near by. The Yukaghir have hardly any reindeer, and sub- **The Yukaghir.** sist on fish; consequently they are poor, and the objects used by them are much simpler than those found among the Koryak. Attention is called to the peculiar shaman's drums and the shaman's coat set with numerous tassels (Case 10). Case 11 contains a model of a Yukaghir tent, and models of boats and fish-traps. There are also birch-bark baskets for household use and for berrying and snowshoes for travelling. The "A" case near by contains objects illustrating their industries, and a series of peculiar pictographic birch-bark records, which are characteristic of this tribe.

The Tungus (Cases 12-15) are a tribe which have recently scattered over extensive areas in eastern Siberia. Their cradles (Case 12) and their garments (Cases 13, 14) are quite **The Tungus.** different in type from those of the more eastern tribes. Their shamans use drums, and they wear coats set with iron ornaments (Case 14). The people use reindeer for riding. Saddles will be found in Case 15. Household furniture, bows and arrows and snowshoes are exhibited in the same case.

The culture of the Yakut, a tribe belonging to the Turkish family, is shown by the specimens in Cases 15 to 18. Until quite recently the religion of the tribe was shamanism. The **The Yakut.** drums and dresses used by their shamans (Case 15) are similar to those of the Tungus. Hunting and fishing and household life are illustrated by specimens in Case 16. The every-day clothing and the more elaborate dresses of the wealthy Yakut are exhibited in Case 17. The "A" case near by contains silver



ornaments used by this people. Case 18, beside the entrance, contains material illustrating the use of the horse among the Yakut. An important part of the subsistence of the tribe is mare's milk, which is made into kumiss and into butter in large leather churns. Kumiss is also used in ceremonials, when it is served in large carved goblets. Butter-jars and large milk-pails are made of birch-bark. The Yakut canoe (top of Case 17) is similar in type to that of the Amur tribes exhibited in Hall 102.

# THE AMERICAN MUSEUM JOURNAL

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## Guide Leaflets.

Issued as supplements to THE AMERICAN MUSEUM JOURNAL.

- No. 1. **THE BIRD ROCK GROUP.** By FRANK M. CHAPMAN, Associate Curator of Mammalogy and Ornithology. October, 1901.
- No. 2. **THE SAGINAW VALLEY COLLECTION.** By HARLAN I. SMITH, Assistant Curator of Archæology. December, 1901.
- No. 3. **THE HALL OF FOSSIL VERTEBRATES.** By W. D. MATTHEW, Ph.D., Assistant Curator of Vertebrate Palæontology. January, 1902.
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- No. 13. **A GENERAL GUIDE TO THE AMERICAN MUSEUM OF NATURAL HISTORY.** January, 1904.



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AMERICAN MUSEUM OF NATURAL HISTORY

# Birds' Nests and Eggs



BY

Frank M. Chapman

Associate Curator, Department of Mammalogy and Ornithology

SUPPLEMENT TO AMERICAN MUSEUM JOURNAL

VOL. IV, No. 2, APRIL, 1904

Guide Leaflet No. 14

*Reprinted, February, 1905*

# American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

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DUCK HAWK  
Group, Hall No. 204

# Birds' Nests and Eggs,

With an Annotated List of the Birds Known  
to Breed within Fifty Miles of  
New York City.

A Guide Leaflet to the Collection  
in the  
American Museum of Natural History.

By

FRANK M. CHAPMAN,

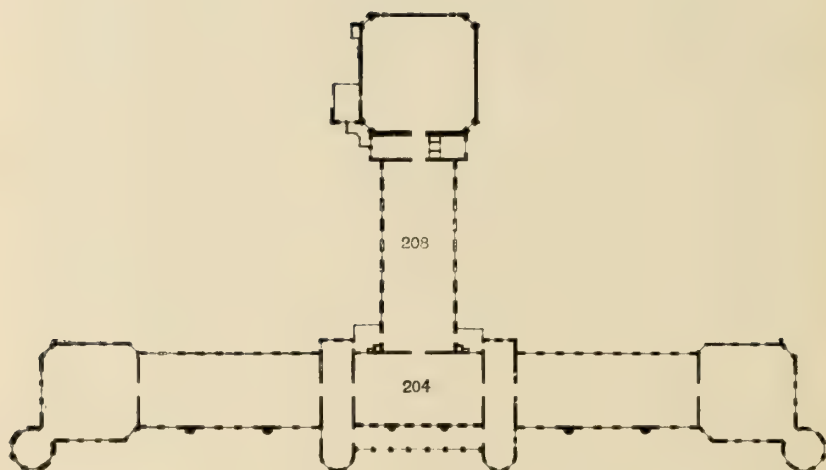
Associate Curator of Mammalogy and Ornithology.

**GUIDE LEAFLET No. 14.**

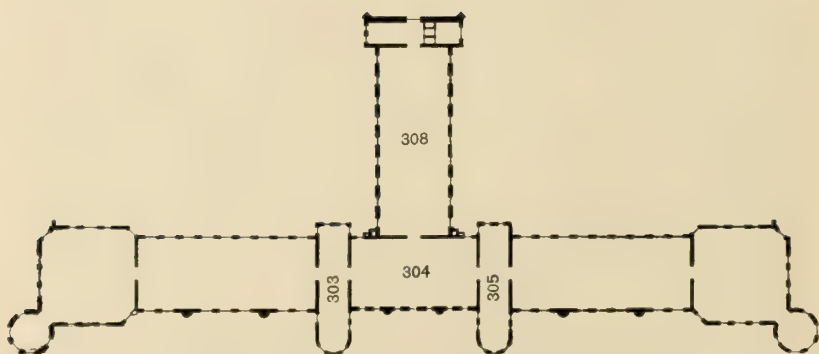
SUPPLEMENT TO THE AMERICAN MUSEUM JOURNAL,

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New York : Published by the Museum.



SECOND, OR MAIN, FLOOR.



THIRD, OR GALLERY, FLOOR.

Key-plans of the Museum building, showing the location of the halls in which the specimens and groups may be found to which references are made in this Guide Leaflet.

# BIRDS' NESTS AND EGGS.

WITH AN ANNOTATED LIST OF THE BIRDS KNOWN TO BREED  
WITHIN FIFTY MILES OF NEW YORK CITY.

BY FRANK M. CHAPMAN,

Associate Curator, Department of Mammalogy and Ornithology.

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## BIRDS' NESTS.

(See the groups in Halls No. 204, 208, 304, 305 and 308, and the desk-cases in Halls No. 208 and 303.)

*Nesting Season.* — The first bird to nest in the region within fifty miles of New York City is the Great Horned Owl. The eggs of this locally rare species have been found as early as February 28, a date when the ground may be covered with snow and the nest itself decorated with icicles. This Owl is followed early in March by the more common Barred Owl, then come the Duck Hawk (Group, Hall No. 204), Woodcock (Group, Hall No. 208), Screech Owl (Group, Hall No. 208), Red-shouldered Hawk (Group, Hall No. 204), Red-tailed Hawk and so on through the list of our 120 breeding birds until we reach the Goldfinch and Cedar Waxwing which do not begin housekeeping until the middle of June.

Year after year essentially the same order of nesting is observed and the question may well be asked, What cause or causes determine the time of a bird's nesting season? Primarily, it may be replied, the date when a bird breeds is governed by the character of the food of its young. Young birds, particularly those



which are born naked and are reared in the nest, are dependent on their parents for food. Often a brood is fed several hundred times during the day and it is therefore of the first importance that there should be an abundant, easily accessible supply of the proper kind of food.

It may be noted that the first birds to nest are Hawks and Owls, which are predaceous, flesh-eating birds living largely on small mice and the like, and have no difficulty in supplying the wants of their young early in the season. In time these birds are followed by seed-, insect- and fruit-eating species, the young of which, therefore, are not hatched until the food they demand can be obtained.

The time of a bird's nesting season is also determined by its status in its breeding range, that is, whether it be a resident or a migratory species. Generally speaking, those species which are with us throughout the year nest earlier than migratory birds of similar habits. It does not always follow, however, that among migratory birds the first species to arrive in the spring are among the earliest to nest; and we learn, furthermore, that the time of a bird's nesting season is dependent on the character of its nesting-site. In this matter of site concealment is usually of the utmost consequence and a bird does not begin to build its nest until it can be properly hidden. For example, Red-winged Blackbirds reach this vicinity as early as the first of March, but they do not nest until the first half of May. The Woodcock, on the contrary, arrives about two weeks later, but nests more than a month earlier, its eggs sometimes being found as early as April 1. The Woodcock, however, nests on the ground and a site is available as soon as it reaches its summer home, while the Red-wing, swinging its woven basket among cat-tails or in bushes, awaits the growth of vegetation which will conceal it. Doubtless, also, the fact that the young Woodcock leave the nest within an hour or two after their birth, while young Red-wings are in the nest about two weeks, may be in part responsible for this difference in nesting dates.

*Nesting Site.* — After the formalities of courtship have won for a bird its mate, nest-building naturally follows as soon as a proper site has been selected. The nature of the situation in which a bird builds its nest appears to be determined *first*, by the necessity

for concealment (see groups of Song Sparrows, Worm-eating Warbler, Black and White Warbler, Hummingbird and others); *second*, by habits, whether arboreal, terrestrial or aquatic (compare the nests of the Red-shouldered Hawk, Kingbird, Grouse, Bob-white, Coot and Grebe); *third*, by haunt, whether in woodland or field, marsh or seashore, etc. (compare the nesting sites of the Catbird, Field Sparrow, Clapper-Rail and Common Tern); *fourth*, by temperament, whether social or solitary (compare the nesting habits of the Duck Hawk and Red-shouldered Hawk with those of the Cliff or Bank Swallow as shown in the groups in Halls No. 204 and 208).

*The Nest Itself.* Probably less than twenty, possibly not more than ten, per cent of the eggs laid by our smaller, perching birds bring forth chicks which reach maturity. So great, therefore, is the mortality among birds in the nest that it is of vital importance for a bird to select a site and build a home in which its eggs may be incubated and young reared with the least possible exposure to the dangers which beset birds at this season.

The character of a bird's nest depends fundamentally on the following factors:

First, Condition of Young at Birth. — Some birds are born covered with feathers and can swim or run about a few hours after leaving the shell. These are termed *præcocial* birds. Others are born practically naked and pass several weeks in the nest. These are termed *altricial* birds. With *præcocial* birds the nest is merely an incubator in which, with the aid of heat supplied by the parent bird, the eggs are hatched. With *altricial* birds the nest is not only an incubator but a cradle as well. It is obvious, therefore, that the nests of the latter class should be far more complete structures than those which are to shelter young birds only while their natal costume is drying. It is also to be remembered that *præcocial* birds nest on the ground, an additional reason why a well-made home is not needed.

Compare the nests and young of the Yellow-headed Blackbird and Warbling Vireo with those of the common Tern, Skimmer or Black Rail and one realizes the close relation existing between birds' nests and the condition in which the young leave the eggs.

Second, Haunt. — The nature of a bird's haunts is often reflected in its nest through the materials employed in construction. Coots and Yellow-headed Blackbirds (Group, Hall No. 308), Red-winged Blackbirds and Marsh Wrens (Group, Hall No. 304) use reeds and marsh grasses; field-inhabiting birds employ the grasses and weed-stalks they find about them, and leaves enter largely into the nest of wood-loving birds. (Examine the groups of the Field Sparrow and the Oven-bird in Hall No. 308.)

Third, Structure of the Bird. — Although birds possessed of the same type of nest-building tools, that is, bill and feet, may build wholly unlike nests (compare the Cliff and Bank Swallows and their nests, Groups in Hall No. 208) the character of the nest is in some degree affected by the structure of the bird. Thus a soft-billed Dove would not be expected to hew out a cavity in trees as do the Woodpeckers, nor could the weak-footed, short-billed Whip-poor-will cling to swaying branches and weave the Oriole's pendent cradle.

Fourth, Necessity for Concealment. — While concealment is secured chiefly through the selection of a site, it is also obtained in the building of the nest. The Oriole's deep cradle (Group, Hall No. 308) is a good type, and further illustrations are furnished by the admirably designed nests of the Oven-bird and Hummingbird, each of which, in a wholly different way, is made to resemble its immediate surroundings.

*Variations in Nesting Habits.* — The existing nesting habits of birds have doubtless been developed through adaptations to changing conditions, and it is of especial interest, therefore, to note any variation in the character of a bird's nest or nesting site and to learn whether the change is a response to some new factor in environment. Barn and Eaves Swallows, Chimney Swifts, Phœbes, Bluebirds and Wrens, for example, have, as a result of the invasion of their haunts by man, adopted new types of nesting sites, while Orioles, Vireos, House Finches and other species often find strings, rags and paper more desirable nest-material than fibres, rootlets and bark.

*Second Broods.* — Several of our earlier nesting species, the Robin, Song Sparrow and Phœbe, for example, rear second and

occasionally even third broods, which sometimes prolongs their nesting season into August. As a rule a new nest is built for the new family.

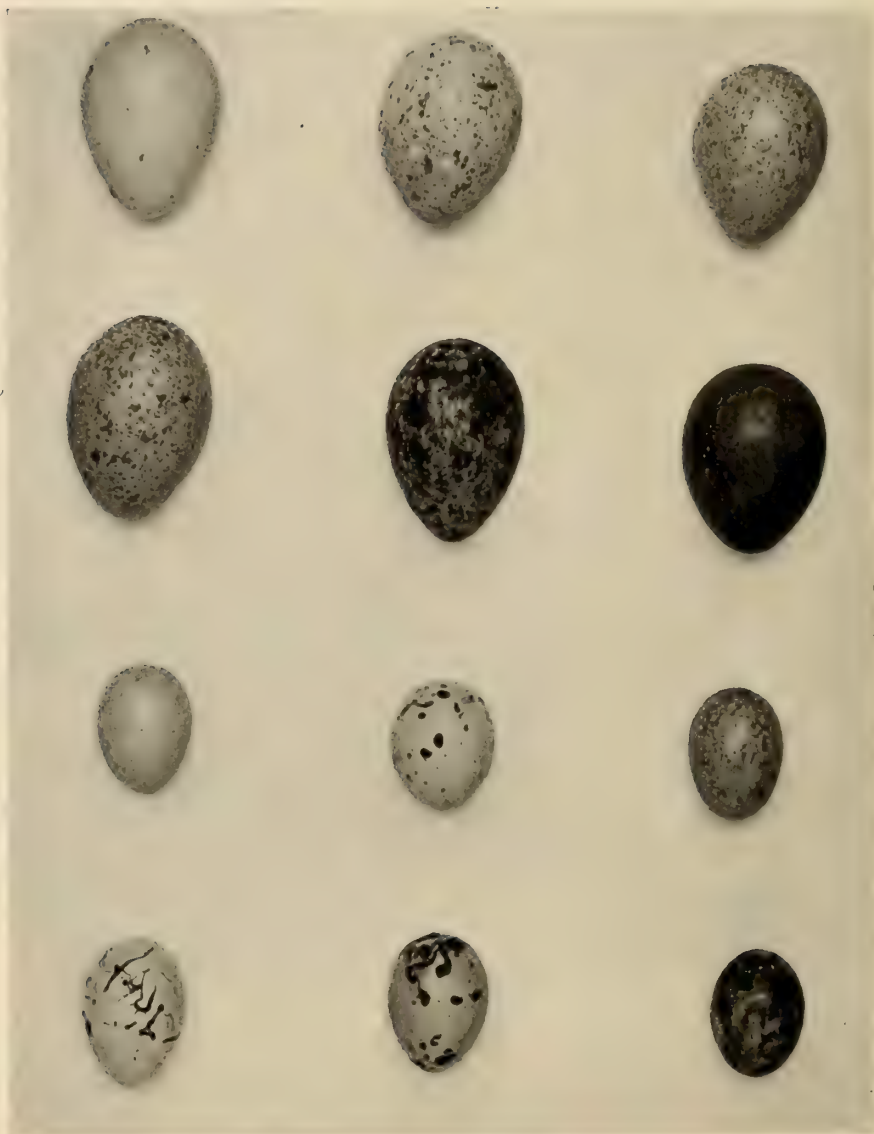
*Return to Same Nesting Site.* — In some instances, the Fish Hawk for example (Group, Hall No. 305), it is known that the same birds not only return to their former nesting localities, but that they actually occupy the same nest, making additions to it year after year.

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CLAPPER RAIL  
Group, Hall No. 208





VARIATIONS IN COLOR OF BIRDS' EGGS

Six upper figures, eggs of the Crow : six lower figures, eggs of Purple Grackle

Desk-case, Alcove No. 3, Hall No. 208



## BIRDS' EGGS.

(See desk-cases in Hall No. 208, and Local Collection, Hall No. 303.)

*Number of Eggs in a "Set" or "Clutch."* — The number of eggs comprising a full "set" or "clutch" ranges from one to as many as twenty. No law governing this number is known. Generally speaking birds of the same family lay approximately the same number of eggs, but there is much variation between birds of closely related families (*e.g.*, Loons and Grebes), while birds of similar nesting habits may not lay the same number of eggs (*e.g.*, Quail and Meadowlark).

The number of eggs in a set, or clutch, is no indication of the fecundity of the bird. At the time of laying the ovary contains a large number of partly formed eggs, of which, normally, only the required number will become fully developed. But if the nest be robbed, the stolen eggs will sometimes be replaced. The long-continued laying of our domestic fowls is an instance of this unnatural stimulation of the ovary caused by persistent robbing.

*Size of Eggs.* — The size of the egg depends primarily upon the size of the bird. The graduated series, from an Ostrich to a Hummingbird (Alcove No. 3, Hall No. 208) represents the range of variation among the eggs of living birds. Size, however, is further influenced by the condition of the young when hatched. Præocial birds, for example, the domestic fowls, lay relatively larger eggs than altricial birds, for example, Pigeons.

This will be appreciated by comparing the egg of the Crow with that of Wallace's Megapode, or the eggs of the Meadowlark with those of the Bartramian Sandpiper (See desk-case, Alcove No. 3, Hall No. 208). The young of the Crow and the Meadowlark are hatched naked and are reared in a well-formed nest. The Sandpiper lays its eggs in a slight depression in the ground, and its young run about soon after birth. The Megapode buries its egg and leaves it to be hatched by the heat generated by decay of the vegetable debris in which it is placed. The young are born fully feathered and ready to fly.

The period of incubation depends upon the size of the egg, and varies from twelve days in the smaller Passeres to fifty-six in the Emeu.

*The Shell.* — The egg-shell is composed largely of carbonate of lime, which is deposited in layers on the surface of the egg in the lower, or uterine, dilation of the oviduct, the process requiring from twelve to twenty hours. The final layers vary greatly in character, and may be simply a rough, chalky deposit, easily scraped off, showing the harder layer below, as in Gannets and Flamingoes, or thin and highly polished, as in Woodpeckers and Tinamous. The structure of the surface, whether pitted or smooth, depends upon the action of the walls of the uterus, from which it receives an impression.

*Colors of Eggs.* — The colors of eggs are due to pigments deposited by ducts while the egg is receiving its shell. One or all the layers of the shell may be pigmented, and variation in color may be caused by a super-imposed stratum of carbonate of lime, producing lilac tints and "clouded" or "shell" markings. It is supposed that eggs are colored for the purpose of rendering them less conspicuous, and, as a rule, birds which nest in holes lay white eggs.

*Shape of Eggs.* — Birds' eggs are generally ovate in form, but there are many variations from this shape. The conical eggs of Snipes and Plovers are placed in the nest point downward or inward, and they fit together so closely that they can easily be covered by the comparatively small-bodied parent. The pyriform egg of Murres, when moved slowly, describes a circle about its own point, and is therefore less liable to roll off the rocky cliffs on which it is laid, than one more oval in shape would be. Contrary to the generally prevalent idea, the egg passes down the oviduct and is deposited large end first.

*Individual Variations.* — Although, generally speaking, eggs of the same species resemble one another, there is so great a range of variation in both color and pattern, that it frequently is impossible to identify eggs unless the parent is known. This variation is due largely to the physiological condition of the bird. Fully adult, vigorous individuals of birds which lay colored eggs, secrete a larger amount of pigment than their younger or weaker

fellows, and their eggs are therefore more heavily marked. The first eggs, as well as the earlier sets, where more than one set is laid in a season, are apt to be more strongly pigmented than the later.

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YELLOW-BILLED CUCKOO  
Group, Hall No. 308



BLACK DUCK  
Group, Hall No. 208



## THE BIRDS KNOWN TO BREED WITHIN FIFTY MILES OF NEW YORK CITY.

1. (6.)<sup>1</sup> **Pied-billed Grebe** (*Podilymbus podiceps*). *Local status:* Chiefly a migrant, sometimes wintering and probably breeding rarely. *Eggs:* 6-10, soiled whitish. *Date:* No definite record. *Group,* Hall No. 208.
2. (58.) **Laughing Gull** (*Larus atricilla*). *Local status:* An uncommon migrant and rare summer resident, nesting now, if at all, in a few localities on Great South Bay. *Site:* Salt marshes. *Eggs:* 3-5, grayish olive-brown or greenish gray, spotted, blotched and scrawled with chocolate. *Date:* June 8. *Group,* Hall No. 208.
3. (70.) **Common Tern; Sea Swallow; Mackerel Gull** (*Sterna hirundo*). *Local status:* Formerly an abundant summer resident, but since its destruction by milliners a comparatively uncommon migrant. It is doubtful if it nests nearer than Gardiner's Island. *Site:* Beaches and sometimes adjoining uplands. *Eggs:* 2-3, very variable, usually olive-gray or olive-green marked with chocolate. *Date:* May 8. *Group,* Hall No. 308.
4. (133.) **Black Duck** (*Anas obscura*). *Local status:* A common migrant and winter visitant: not known to nest nearer than Gardiner's Island. *Site:* On the ground, in undergrowth or heavy grasses, not necessarily in the immediate vicinity of water. *Eggs:* 8-12, pale greenish or bluish white or creamy. *Date:* May 5. *Group,* Hall No. 208.
5. (144.) **Wood Duck** (*Aix sponsa*). *Local status:* A not uncommon migrant: rare and local in the summer. *Site:* A hollow in a tree, usually twenty feet or more from the ground. *Eggs:* 8-14, pale buffy white. *Date:* May 6.
6. (190.) **Bittern** (*Botaurus lentiginosus*). *Local status:* Not uncommon migrant: rare summer resident. *Site:* On the ground in grassy marshes. *Eggs:* 3-5, pale olive-buff. *Date:* May 10.
7. (191.) **Least Bittern** (*Ardetta exilis*). *Local status:* Rather rare and local summer resident, more common and generally distributed during migrations. *Site:* Reedy marshes, usually 2-4 feet above water. *Eggs:* 4-6, bluish white. *Date:* May 31.
8. (201.) **Little Green Heron** (*Butorides virescens*). *Local status:* Common summer resident. *Site:* Bushes or trees from 5-20 feet from the ground. *Eggs:* 4-5, pale, dull blue. *Date:* May 6.
9. (202.) **Black-crowned Night Heron** (*Nycticorax nycticorax naevius*). *Local status:* Locally abundant summer resident, nesting in colonies. *Site:* In trees 20-80 feet from the ground. *Eggs:* 4-6, pale, dull blue. *Date:* May 1.
10. (208.) **Kin's Rail** (*Rallus elegans*). *Local status:* Rare summer resident. *Site:* On the ground in grassy fresh-water marshes. *Eggs:* 7-12, buffy white, heavily spotted and speckled with rufous-brown. *Date:* May 15.
11. (211.) **Clapper Rail; Mud Hen** (*Rallus crepitans*). *Local status:*

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<sup>1</sup> The numbers between parentheses refer to the Check-List of North American Birds of the American Ornithologists Union.





WOODCOCK

Group, Hall No. 208

Abundant summer resident. *Site*: On the ground in salt, coastal marshes. *Eggs*: 8-12, buffy white, speckled and spotted with rufous-brown. *Date*: May 10. Group, Hall No. 208.

12. (212.) **Virginia Rail** (*Rallus virginianus*). *Local status*: Rather rare and local summer resident. *Site*: On the ground in marshy places. *Eggs*: 6-12, pale buffy white, spotted and speckled with rufous-brown. *Date*: May 15.

13. (214.) **Sora; Carolina Rail** (*Porzana carolina*). *Local status*: Rare summer resident on Long Island; abundant fall migrant in wild rice marshes. *Site*: On ground in marshy places. *Eggs*: 8-15, buffy white, spotted and speckled with rufous-brown. *Date*: May 20.

14. (228.) **American Woodcock** (*Philohela minor*). *Local status*: Not uncommon summer resident. *Site*: On the ground in or near woods. *Eggs*: 4, buffy, distinctly and obscurely spotted with shades of rufous. *Date*: April 1. Group, Hall No. 208.

15. (261.) **Upland Plover; Bartramian Sandpiper** (*Bartramia longicauda*). *Local status*: Uncommon and local summer resident. *Site*: On the ground in any field. *Eggs*: 4, creamy white, or buff, spotted with reddish brown or chocolate, chiefly at the larger end. *Date*: June 1.

16. (263.) **Spotted Sandpiper; Tip-up** (*Actitis macularia*). *Local status*: Common summer resident. *Site*: On the ground, usually near water. *Eggs*: 4, creamy buff or white, thickly spotted and speckled with chocolate, chiefly at the larger end. *Date*: May 24.

17. (273.) **Killdeer** (*Oxyechus vociferus*). *Local status:* Rare and local summer resident. *Site:* On the ground in pastures or cornfields. *Eggs:* 4, buffy white, spotted and scrawled with chocolate, chiefly at the larger end. *Date:* May 10.

18. (289.) **Bob-White** (*Colinus virginianus*). *Local status:* Not uncommon resident. *Site:* On the ground in fields, often near fences or hedges. *Eggs:* 10-18, white. *Date:* May 26. Group, Hall No. 208.

19. (300.) **Ruffed Grouse** (*Bonasa umbellus*). *Local status:* Of local distribution in the more heavily wooded sections. *Site:* On the ground in the woods, often at the base of a tree. *Eggs:* 8-14, pale ochraceous-buff. *Date:* May 10. Group, Hall. No. 208.

20. (316.) **Mourning Dove** (*Zenaidura macroura*). *Local status:* Common summer resident. *Site:* Lower branches of trees, generally within 10 feet of the ground, very rarely on the ground. *Eggs:* 2, white. *Date:* April 25.

21. (331.) **Marsh Hawk** (*Circus hudsonius*). *Local status:* Common summer resident, of rare occurrence in winter. *Site:* On the ground in marshes. *Eggs:* 4-6, dull white or pale bluish white. *Date:* May 20.

22. (332.) **Sharp-shinned Hawk** (*Accipiter velox*). *Local status:* Not common summer resident, rare in winter. *Site:* In trees, 15-40 feet from the ground. *Eggs:* 3-6, varying from bluish to pale cream buff, distinctly spotted or heavily blotched with cinnamon or cinnamon rufous. *Date:* May 21.

23. (333.) **Cooper Hawk** (*Accipiter cooperii*). *Local status:* Not uncommon in summer, rare in winter. *Site:* In trees, 25-60 feet from the ground. *Eggs:* 3-6, pale bluish white, sometimes speckled with brownish. *Date:* May 1.

24. (337.) **Red-tailed Hawk** (*Buteo borealis*). *Local status:* Permanent resident, more numerous in winter. *Site:* In trees, 30-70 feet from the ground. *Eggs:* 2-4, dull white, generally scantily and irregularly marked with cinnamon-brown. *Date:* April 1.

25. (339.) **Red-shouldered Hawk** (*Buteo lineatus*). *Local status:* Common permanent resident. *Site:* In trees, 30-60 feet from the ground. *Eggs:* 2-5, dull white, generally more or less sprinkled, spotted or blotched with cinnamon or chocolate. *Date:* April 3. Group, Hall No. 204.

26. (343.) **Broad-winged Hawk** (*Buteo platypterus*). *Local status:* Not common permanent resident. *Site:* In trees, 25-50 feet from the ground. *Eggs:* 2-4, dull white, speckled, blotched or washed with ochraceous-buff or cinnamon brown. *Date:* May 5.

27. (356.) **Duck Hawk** (*Falco peregrinus anatum*). *Local status:* Rare and local summer resident, more common on coasts in migrations. *Site:* A cliff. *Eggs:* 3-4, creamy white marked with cinnamon-brown to reddish brown. *Date:* March 30.

28. (360.) **Sparrow Hawk** (*Falco sparverius*). *Local status:* Not uncommon in summer, rare in winter. *Site:* Usually a hole in a tree, from 15-60 feet from the ground. *Eggs:* 3-7, creamy white to rufous, generally finely and evenly marked with shades of the ground color. *Date:* April 25.

29. (374.) **American Osprey; Fish Hawk** (*Pandion haliaetus carolinensis*). *Local status:* Locally common summer resident near the coasts. *Site:* In a tree, 15-50 feet from the ground. *Eggs:* 2-4, rarely dull white, sometimes almost solid chocolate, generally buffy white, heavily marked with chocolate, chiefly at the larger end. *Date:* May 2. Group, Hall No. 205.

30. (365.) **Barn Owl** (*Strix pratincola*). *Local status:* A rare summer resident. *Site:* A hole in a tree, sometimes in a tower or church-steeple. *Eggs:* 5-9, white. *Date:* April 20.

31. (366.) **Long-eared Owl** (*Asio wilsonianus*). *Local status:* An uncommon resident. *Site:* Generally in an old crow's, hawk's or squirrel's nest. *Eggs:* 3-6, white. *Date:* April 1.

32. (368.) **Barred Owl** (*Syrnium varium*). *Local status:* Common permanent resident. *Site:* In a hollow tree, and sometimes in an old crow's or hawk's nest. *Eggs:* 2-4, white. *Date:* March 12.

33. (373.) **Screech Owl** (*Megascops asio*). *Local status:* Common permanent resident. *Site:* Generally in a hollow tree. *Eggs:* 4-6, white. *Date:* April 3. Group, Hall No. 208.

34. (375.) **Great Horned Owl** (*Bubo virginianus*). *Local status:* Rare permanent resident, restricted to the less settled and heavily wooded regions. *Site:* Generally an old hawk's, squirrel's or crow's nest. *Eggs:* 2-3, white. *Date:* February 28.

35. (386.) **Black-billed Cuckoo** (*Coccyzus erythrophthalmus*). *Local status:* Common summer resident. *Site:* Generally in low trees, vines or bushes, 4-10 feet from the ground. *Eggs:* 2-5, dull greenish blue. *Date:* May 29.

36. (387.) **Yellow-billed Cuckoo** (*Coccyzus americanus*). *Local status:* Common summer resident. *Site:* Generally in low trees, vines or bushes, 4-10 feet from the ground. *Eggs:* 3-5, dull greenish blue. *Date:* May 30. Group, Hall No. 308.

37. (390.) **Kingfisher** (*Ceryle alcyon*). *Local status:* Locally common summer resident. *Site:* In a hole in a bank, about 6 feet from the entrance. *Eggs:* 5-8, white. *Date:* May 1.

38. (393.) **Hairy Woodpecker** (*Dryobates villosus*). *Local status:* Not uncommon permanent resident. *Site:* In a hole, generally in a dead tree. *Eggs:* 4-5, white. *Date:* May 23.

39. (394.) **Downy Woodpecker** (*Dryobates pubescens medianus*). *Local status:* Very common permanent resident. *Site:* In a hole, generally in a dead tree. *Eggs:* 4-6, white. *Date:* May 21.

40. (406.) **Red-headed Woodpecker** (*Melanerpes erythrocephalus*). *Local status:* Local summer resident of irregular distribution, sometimes winters, rarely abundant in migrations. *Site:* A hole, generally in a dead tree. *Eggs:* 4-6, white. *Date:* May 13.

41. (412.) **Flicker; High-hole** (*Colaptes auratus luteus*). *Local status:* Common summer resident, abundant migrant, rare in winter. *Site:* In a hole in a tree, frequently in orchards, about 10 feet from the ground. *Eggs:* 5-9, white. *Date:* May 7.

42. (417.) **Whip-poor-will** (*Antrostomus vociferus*). *Local status:* Locally common summer resident. *Site:* No nest, the eggs being laid on the bare ground or dead leaves in the woods. *Eggs:* 2, dull white, with delicate, obscure, lilac markings and a few distinct brownish gray specks. *Date:* June 3.

43. (420.) **Nighthawk** (*Chordeiles virginianus*). *Local status:* Locally common summer resident, frequently seen in the city. *Site:* Nest, none, the eggs being laid on the bare ground, in open fields, or on the flat roof of a house. *Eggs:* 2, dull white, evenly marked with small irregular shaped blotches or speckling of grayish brown or brownish gray. *Date:* June 1.





RUFFED GROUSE  
Group, Hall No. 208

## LOCAL BREEDING BIRDS

44. (423.) **Chimney Swift** (*Chaetura pelagica*). *Local status:* Abundant summer resident, frequenting the city in numbers. *Site:* The inside of a chimney. The nest is attached to the side, generally about 10 feet from the top. *Eggs:* 4-6, white. *Date:* May 25. Group, Hall No. 208.

45. (428.) **Ruby-throated Hummingbird** (*Trochilus colubris*). *Local status:* Common summer resident. *Site:* The limb of a tree, generally 10-25 feet from the ground. *Eggs:* 2, white. *Date:* May 12. Group, Hall No. 308.

46. (444.) **Kingbird** (*Tyrannus tyrannus*). *Local status:* Common summer resident. *Site:* Usually orchards or shade trees, near the end of a branch, 15-25 feet from the ground. *Eggs:* 3-5, white, spotted with umber. *Date:* May 29. Group, Hall No. 308.

47. (452.) **Crested Flycatcher** (*Myiarchus crinitus*). *Local status:* Common summer resident. *Site:* In a hollow tree, generally less than 20 feet from the ground. *Eggs:* 3-6, creamy white streaked longitudinally with chocolate. *Date:* June 3.

48. (456.) **Phoebe** (*Sayornis phoebe*). *Local status:* Common summer resident. *Site:* A beam or rafter in an outbuilding or under a piazza or bridge, often under a bank or shelving rock. *Eggs:* 4-6, white. *Date:* April 28.

49. (461.) **Wood Pewee** (*Contopus virens*). *Local status:* Common summer resident. *Site:* Generally saddled on a limb 20-30 feet from the ground. *Eggs:* 3-4, white, with a wreath of umber markings about the larger end. *Date:* June 5.

50. (465.) **Green-crested or Acadian Flycatcher** (*Empidonax virens*). *Local status:* Common summer resident in the Hudson Valley as far north as Ossining; apparently rare elsewhere. *Site:* The lower limbs of a tree, often of a beech, about eight feet from the ground. *Eggs:* 3-4, white, with a few cinnamon spots. *Date:* May 14. Group, Hall No. 308.

51. (466.) **Alder Flycatcher** (*Empidonax traillii alnerum*). *Local status:* Not common migrant, rare and local summer resident, has been found nesting only at Nyack, N. Y., and Plainfield, N. J. (Miller). *Eggs:* 3-4, creamy white, with cinnamon-brown markings about the larger end. *Date:* June 16.

52. (467.) **Least Flycatcher; Chebec** (*Empidonax minimus*). *Local status:* Common summer resident. *Site:* Generally in a crotch of a fruit or shade tree, 10-20 feet from the ground. *Eggs:* 3-5, white. *Date:* May 21.

53. (477.) **Blue Jay** (*Cyanocitta cristata*). *Local status:* Permanent resident, abundant in fall, common in winter, less numerous in summer. *Site:* Usually in crotch of a tree 10-20 feet from the ground. *Eggs:* 4-6, pale olive-green, rather thickly marked with varying shades of cinnamon-brown. *Date:* May 14.

54. (488.) **American Crow** (*Corvus americanus*). *Local status:* Abundant permanent resident. *Site:* In trees in woods, 20 to 50 feet from the ground. *Eggs:* 4-6, generally bluish green, thickly marked with shades of brown, but sometimes light blue or even white with almost no markings. *Date:* April 9.

55. (490.) **Fish Crow** (*Corvus ossifragus*). *Local status:* Common summer resident of Hudson Valley as far north as Ossining, less so on Long Island; in winter restricted to the coast. *Site:* In trees in woods, generally 20-50 feet from the ground. *Eggs:* 4-5, similar in color to those of preceding species, but smaller. *Date:* May 17.

56. (493.) **Starling** (*Sturnus vulgaris*). *Local status:* Introduced into





SCREECH OWL  
Group, Hall No. 208

## LOCAL BREEDING BIRDS

Central Park in 1890 and now a common permanent resident. *Site*: Holes in buildings or in trees. *Eggs*: 4-6, pale bluish.

57. (494.) **Bobolink; Reedbird** (*Dolichonyx oryzivorus*). *Local status*: Locally common summer resident, apparently decreasing in numbers, abundant fall migrant in wild rice marshes. *Site*: On the ground in pastures and meadows. *Eggs*: 4-6, grayish white, with numerous spots of olive-brown or umber. *Date*: May 29.

58. (495.) **Cowbird** (*Molothrus ater*). *Local status*: A common summer resident and abundant migrant. *Site*: Parasitic, laying eggs in the nests of other species. *Eggs*: white, evenly speckled with cinnamon-brown or umber. *Date*: May 5.

59. (498.) **Red-winged Blackbird** (*Agelaius phœniceus*). *Local status*: Abundant summer resident. *Site*: In grassy or bushy borders of pond, 3-6 feet from the ground, in reeds, bushes or tussock of grass. *Eggs*: 3-6, pale blue, streaked, spotted or scrawled with dark purple or black. *Date*: May 18. Group, Hall No. 304.

60. (501.) **Meadowlark** (*Sturnella magna*). *Local status*: Common summer resident, rare in winter. *Site*: On the ground, in pastures and meadows. *Eggs*: 4-6, white, speckled with reddish brown. *Date*: May 10.

61. (506.) **Orchard Oriole** (*Icterus spurius*). *Local status*: Locally common summer resident. *Site*: Generally in orchards, 10-15 feet from the ground, near the extremity of a limb. *Eggs*: 3-5, bluish white, spotted, blotched and scrawled with blackish. *Date*: May 30. Group, Hall No. 308.

62. (507.) **Baltimore Oriole** (*Icterus galbula*). *Local status*: Common summer resident. *Site*: Generally in fruit or shade trees, near the extremity of a limb, 20-40 feet from the ground. *Eggs*: 4-6, white, scrawled with blackish lines and with a few spots or blotches. *Date*: May 25. Group, Hall No. 308.

63. (511.) **Purple Grackle; Crow Blackbird** (*Quiscalus quiscula*). *Local status*: Abundant migrant, locally common summer resident, nesting in colonies. *Site*: In colonies, generally in coniferous trees, about 30 feet from the ground. *Eggs*: 3-6, very variable, generally pale bluish or bluish green, spotted, blotched or scrawled with brown or black, but sometimes evenly speckled with brownish and rarely almost solid cinnamon- or rufous-brown. *Date*: April 25. Group, Hall No. 305.

64. (517.) **Purple Finch** (*Carpodacus purpureus*). *Local status*: Rare and local summer resident, common in migrations and sometimes in winter. *Site*: Generally in a coniferous tree, 5-30 feet from the ground. *Eggs*: 4-6, blue, spotted about the larger end with blackish. *Date*: May 24.

65. — **House Sparrow; English Sparrow** (*Passer domesticus*). *Local status*: Introduced from Europe in 1851 and later dates and now an abundant permanent resident. *Site*: About buildings or in trees. *Eggs*: 4-7, generally white, finely and evenly marked with olive, sometimes plain white or almost uniform olive-brown.

66. (529.) **Goldfinch** (*Astragalinus tristis*). *Local status*: Common permanent resident. *Site*: In a bush or tree, 5-30 feet from the ground. *Eggs*: 4-6, pale bluish white. *Date*: June 20.

67. (540.) **Grass Finch; Vesper Sparrow** (*Poœcetes gramineus*). *Local status*: Common summer resident. *Site*: On the ground, generally in dry.



BANK SWALLOW  
Group, Hall No. 208



## LOCAL BREEDING BIRDS

grassy fields. *Eggs:* 4-5, bluish or pinkish white, speckled and blotched with brown. *Date:* May 10.

68. (542a.) **Savanna Sparrow** (*Passerculus sandwichensis savanna*). *Local status:* Rare summer resident, abundant migrant. *Site:* On the ground, generally in wet meadows. *Eggs:* 4-5, bluish white, thickly marked with reddish brown or cinnamon. *Date:* May 10.

69. (546.) **Grasshopper Sparrow** (*Coturniculus savannarum passerinus*). *Local status:* Locally common summer resident. *Site:* On the ground in dry grassy fields. *Eggs:* 4-5, white, spotted and speckled with reddish brown. *Date:* May 28.

70. (547.) **Henslow Sparrow** (*Ammodramus henslowii*). *Local status:* Rare and local summer resident. *Site:* On the ground, generally in wet meadows. *Eggs:* 4-5, grayish white, thickly and evenly marked with pale reddish brown. *Date:* May 10.

71. (549.) **Sharp-tailed Finch** (*Ammodramus caudacutus*). *Local status:* Abundant summer resident in salt marshes. *Site:* On the ground, in salt marshes. *Eggs:* 3-4, whitish, finely speckled with cinnamon-brown, especially at the larger end. *Date:* May 30. Group, Hall No. 308.

72. (550.) **Seaside Finch** (*Ammodramus maritimus*). *Local status:* Abundant summer resident of salt coastal marshes. *Site:* On the ground, in salt marshes. *Eggs:* 3-4, whitish, clouded or finely speckled with cinnamon-brown, especially at the larger end. *Date:* May 30. Group, Hall No. 308.

73. (560.) **Chipping Sparrow** (*Spizella socialis*). *Local status:* Abundant summer resident. *Site:* In trees or bushes, near houses or cultivated grounds, 5-20 feet from the ground. *Eggs:* 4-5, greenish blue, with cinnamon-brown or blackish markings, chiefly at the larger end. *Date:* May 14.

74. (562.) **Field Sparrow** (*Spizella pusilla*). *Local status:* Abundant summer resident. *Site:* In bushy fields, on the ground, or in a low shrub. *Eggs:* 3-5, whitish, with numerous reddish brown markings, chiefly about the larger end. *Date:* May 15. Group, Hall No. 308.

75. (581.) **Song Sparrow** (*Melospiza cinerea melodia*). *Local status:* Common winter, abundant summer resident. *Site:* Generally on the ground, sometimes in a low bush. *Eggs:* 4-5, whitish, with numerous reddish brown markings which sometimes nearly conceal the ground color. *Date:* April 29. Group, Hall No. 308.

76. (584.) **Swamp Sparrow** (*Melospiza georgiana*). *Local status:* Abundant summer resident, rare in winter. *Site:* On the ground, in wet meadows or marshes. *Eggs:* 4-5, resemble those of the preceding species, but the markings generally more confluent. *Date:* May 15. Group, Hall No. 308.

77. (587.) **Towhee; Chewink** (*Pipilo erythrophthalmus*). *Local status:* Abundant summer resident. *Site:* On the ground, in or at the border of woods or thickets. *Eggs:* 4-5, white, finely and evenly speckled with reddish brown, sometimes blotched at the larger end. *Date:* May 14. Group, Hall No. 308.

78. (593.) **Cardinal** (*Cardinalis cardinalis*). *Local status:* Local permanent resident. *Site:* Generally in bushes in dense thickets. *Eggs:* 3-4, white or bluish white, spotted or speckled with grayish or reddish brown. *Date:* May 3. Group, Hall No. 208.





BLACK AND WHITE WARBLER

Group, Hall No. 308

79. (595.) **Rose-breasted Grosbeak** (*Zamelodia ludoviciana*). *Local status:* Common summer resident. *Site:* In bushes or small trees, 5-20 feet from the ground. *Eggs:* 4-5, pale blue, with numerous reddish brown or olive-brown markings. *Date:* May 20. Group, Hall No. 208.

80. (598.) **Indigo Bunting** (*Cyanospiza cyanea*). *Local status:* Common summer resident. *Site:* Generally in the crotch of a bush near the ground. *Eggs:* 3-4, pale bluish white. *Date:* May 29. Group, Hall No. 208.

81. (608.) **Scarlet Tanager** (*Piranga erythromelas*). *Local status:* Common summer resident. *Site:* Generally near the end of a horizontal limb, 7-20 feet from the ground. *Eggs:* 3-4, pale greenish blue with numerous reddish brown markings. *Date:* June 3. Group, Hall No. 304.

82. (611.) **Purple Martin** (*Progne subis*). *Local status:* Local summer resident, apparently decreasing in numbers. *Site:* In bird-boxes or gourds, erected for the bird's occupation. *Eggs:* 4-5, white, with numerous spots of olive-brown or reddish brown. *Date:* May 25.

83. (612.) **Cliff Swallow; Eaves Swallow** (*Petrochelidon lunifrons*). *Local status:* Local summer resident, apparently decreasing in numbers. *Site:* Placed beneath a cliff, or under the eaves of a barn or other building. *Eggs:* 4-5, white, with numerous blotches of olive-brown or reddish brown. *Date:* May 30. Group, Hall No. 208.

84. (613.) **Barn Swallow** (*Hirundo erythrogaster*). *Local status:* Abundant summer resident. *Site:* Generally placed on the rafter of a barn or out-building. *Eggs:* 4-6, white, with numerous blotches of olive-brown or reddish brown, and generally smaller than those of the preceding species. *Date:* May 8.

85. (614.) **Tree Swallow** (*Iridoprocne bicolor*). *Local status:* Rare and local summer resident, abundant migrant, particularly from late July to October. *Site:* In a hollow tree or bird-box. *Eggs:* 4-7, white. *Date:* May 19.

86. (616.) **Bank Swallow** (*Riparia riparia*). *Local status:* Locally abundant summer resident. *Site:* In a hole in a sand-bank, 2-3 feet from the entrance. *Eggs:* 4-6, white. *Date:* May 19. Group, Hall No. 208.

87. (617.) **Rough-winged Swallow** (*Stelgidopteryx serripennis*). *Local status:* Local and not common summer resident. *Site:* Beneath bridges, in stone walls, or a hole in a bank. *Eggs:* 4-8, white. *Date:* May 30.

88. (619.) **Cedar Waxwing** (*Ampelis cedrorum*). *Local status:* Common summer resident. *Site:* Generally in fruit or shade trees, 5-20 feet from the ground. *Eggs:* 3-5, pale bluish gray, blotched with black or umber. *Date:* June 19.

89. (624.) **Red-eyed Vireo** (*Vireo olivaceus*). *Local status:* Abundant summer resident. *Site:* Suspended from a forked branch, 4-40 feet from the ground. *Eggs:* 3-4, white, with a few blackish spots about the larger end. *Date:* May 28.

90. (627.) **Warbling Vireo** (*Vireo gilvus*). *Local status:* Locally common summer resident. *Site:* Suspended from a forked branch, usually in shade trees, 8-40 feet from the ground. *Eggs:* 3-4, white, usually with a few blackish or brownish spots about the larger end. *Date:* May 30. Group, Hall No. 308.

91. (628.) **Yellow-throated Vireo** (*Vireo flavifrons*). *Local status:* Common summer resident. *Site:* Suspended from a forked branch, 10-30 feet from the ground. *Eggs:* 3-4, white, with a few specks or spots of blackish or brownish, chiefly about the larger end. *Date:* May 28.

92. (631.) **White-eyed Vireo** (*Vireo noveboracensis*). *Local status:* Common summer resident. *Site:* In thickets suspended from a forked branch, 1-4 feet from the ground. *Eggs:* 3-4, white, with a few specks of blackish or brownish at the larger end. *Date:* May 25. Group, Hall No. 308.

93. (636.) **Black and White Warbler** (*Mniotilta varia*). *Local status:* Common summer resident. *Site:* On the ground in the woods, generally at the base of tree, stump or rock. *Eggs:* 4-5, white, spotted and speckled with cinnamon-brown to umber, chiefly in a wreath at the larger end. *Date:* May 18. Group, Hall No. 308.

94. (639.) **Worm-eating Warbler** (*Helmitheros vermivorus*). *Local status:* Rather rare and local summer resident. *Site:* On the ground, generally in dry woods. *Eggs:* 4-6, white, speckled, spotted or blotched with cinnamon- or reddish-brown. *Date:* May 20. Group, Hall No. 308.

95. (641.) **Blue-winged Warbler** (*Helminthophila pinus*). *Local status:* Generally common summer resident; not common on Long Island. *Site:* On the ground, usually in or near second growths. *Eggs:* 4-6, white, thinly speckled with reddish brown. *Date:* May 16. Group, Hall No. 308.

96. (642.) **Golden-winged Warbler** (*Helminthophila chrysoptera*). *Local status:* Rare summer resident, sometimes not uncommon August migrant.



WORM-EATING WARBLER

Group, Hall No. 308

*Site:* On the ground, usually in or near second growth. *Eggs:* 4-5, white, speckled, chiefly about the larger end, with brownish. *Date:* May 30.

97. (648.) **Parula Warbler** (*Compsothlypis americana usneæ*). *Local status:* Common migrant, local summer resident, nesting only where *Usnea* moss occurs. *Site:* In bunches of hanging *Usnea* moss. *Eggs:* 4-5, white, with reddish brown markings, chiefly about the larger end. *Date:* May 22.

98. (652.) **Summer Yellowbird; Yellow Warbler** (*Dendroica æstiva*) *Local status:* Abundant summer resident. *Site:* In bushes or trees 4-20 feet from the ground. *Eggs:* 4-5, bluish white, thickly marked with brownish, with frequently a wreath about the larger end. *Date:* May 20. Group, Hall No. 308.

99. (659.) **Chestnut-sided Warbler** (*Dendroica pensylvanica*). *Local status:* Locally common summer resident, increasing in numbers. *Site:* In bushes, usually about 3 feet from the ground. *Eggs:* 4-5, white, with numerous cinnamon- and olive-brown markings, chiefly in a wreath about the larger end. *Date:* May 29.



## LOCAL BREEDING BIRDS

100. (673.) **Prairie Warbler** (*Dendroica discolor*). *Local status:* Locally common on Long Island, rare elsewhere. *Site:* In briery bushes about 3 feet from the ground. *Eggs:* 4-5, white, spotted with cinnamon- or olive-brown, chiefly in a wreath at the larger end. *Date:* May 30. Group, Hall No. 308.

101. (674.) **Oven-bird** (*Seiurus aurocapillus*). *Local status:* Abundant summer resident. *Site:* On the ground, usually in dry woods. *Eggs:* 4-5, white, speckled with reddish brown. *Date:* May 20. Group, Hall No. 308.

102. (676.) **Large-billed Water-Thrush** (*Seiurus motacilla*). *Local status:* Not uncommon summer resident in lower Hudson Valley and northern New Jersey, rare on Long Island. *Site:* In wet woods, beneath a bank, or the upturned roots of a fallen tree. *Eggs:* 4-6, white, speckled or spotted with reddish brown. *Date:* May 11.

103. (677.) **Kentucky Warbler** (*Geothlypis formosa*). *Local status:* Locally common in the Hudson River Valley as far north as Ossining, rare elsewhere. *Site:* In the woods, on or near the ground. *Eggs:* 4-5, white, speckled or blotched with reddish brown. *Date:* June 1.

104. (681.) **Northern Yellow-throat** (*Geothlypis trichas brachidactyla*). *Local status:* Abundant summer resident. *Site:* In swampy thickets, on the ground. *Eggs:* 4-5, white, thinly speckled and spotted with reddish brown, chiefly at the larger end. *Date:* May 25. Group, Hall No. 308.

105. (683.) **Yellow-breasted Chat** (*Icteria virens*). *Local status:* Common summer resident. *Site:* In thickets, 2-3 feet from the ground, in the crotch of a bush. *Eggs:* 3-5, white, rather evenly speckled and spotted with reddish brown. *Date:* May 23.

106. (684.) **Hooded Warbler** (*Wilsonia mitrata*). *Local status:* Common summer resident in the lower Hudson Valley and eastward along the Sound, apparently a rare breeder elsewhere. *Site:* In woods, 2-4 feet from the ground, in the crotch of a bush or sapling. *Eggs:* 4-5, creamy white, thinly speckled or spotted with reddish brown; color generally in a wreath at the larger end. *Date:* May 15.

107. (687.) **Redstart** (*Setophaga ruticilla*). *Local status:* Abundant summer resident. *Site:* In the crotch of a sapling, 5-20 feet from the ground. *Eggs:* 4-5, bluish white, spotted and blotched, chiefly at the larger end, with cinnamon- or olive-brown. *Date:* May 17. Group, Hall No. 308.

108. (704.) **Catbird** (*Galeoscoptes carolinensis*). *Local status:* Abundant summer resident. *Site:* In thickets, about 3-5 feet from the ground. *Eggs:* 3-5, greenish blue. *Date:* May 17.

109. (705.) **Brown Thrasher** (*Toxostoma rufum*). *Local status:* Common summer resident. *Site:* In thickets, in the fork of a bush, or on the ground. *Eggs:* 3-6, grayish white, thickly, evenly and minutely speckled with reddish brown. *Date:* May 16. Group, Hall No. 208.

110. (718.) **Carolina Wren** (*Thryothorus ludovicianus*). *Local status:* Permanent resident of irregular distribution, evidently increasing in numbers. *Site:* In a hollow in a tree, bird-box or out-house. *Eggs:* 4-6, creamy white, with numerous reddish-brown and lavender markings. *Date:* March 28.

111. (721.) **House Wren** (*Troglodytes aëdon*). *Local status:* Common summer resident. *Site:* In a hole in a tree or stump, a bird-box or crevice in an out-building. *Eggs:* 6-8, vinaceous, uniform or minutely speckled, with generally a wreath of a darker shade at the larger end. *Date:* May 18.





LOUISIANA WATER-THRUSH  
Group, Hall No. 308



LONG-BILLED MARSH WREN  
Group, Hall No. 308

112. (724.) **Short-billed Marsh Wren** (*Cistothorus stellaris*). *Local status:* Local summer resident, generally rare. *Site:* On or near the ground in a tussock of tall grass. *Eggs:* 6-8, white, rarely with a few lavender spots. *Date:* June 7.

113. (725.) **Long-billed Marsh Wren** (*Telmatodytes palustris*). *Local status:* Abundant summer resident. *Site:* In marshes, attached to reeds, about 4 feet from the ground. *Eggs:* 5-9, uniform, minutely speckled or thickly marked with cinnamon- or olive-brown. *Date:* May 31. Group, Hall No. 304.

114. (727.) **White-bellied Nuthatch** (*Sitta carolinensis*). *Local status:* Common permanent resident. *Site:* In a hole in a tree or stump. *Eggs:* 5-8, creamy white, thickly and evenly spotted and speckled with rufous and lavender. *Date:* April 17.

115. (731.) **Tufted Titmouse** (*Bæolophus bicolor*). *Local status:* Not uncommon permanent resident in northern New Jersey and on Staten Island, sometimes extending farther north. *Site:* In a hole in a tree, stump or similar situation. *Eggs:* 5-8, creamy white, rather coarsely and evenly marked with reddish brown. *Date:* May 22.

116. (735.) **Chickadee** (*Parus atricapillus*). *Local status:* Common permanent resident, less numerous in summer. *Site:* In an old stump or hollow limb, 5-15 feet from the ground. *Eggs:* 5-9, white, spotted and speckled, chiefly at the larger end, with reddish brown. *Date:* May 19.

117. (755.) **Wood Thrush** (*Hylocichla mustelina*). *Local status:* Abundant summer resident. *Site:* Generally in the woods, in a sapling about 6-8 feet from the ground. *Eggs:* 3-5, greenish blue. *Date:* May 17. Group, Hall No. 208.

118. (756.) **Wilson Thrush; Veery** (*Hylocichla fuscescens*). *Local status:* Common summer resident. *Site:* In low, wet woods, on or near the ground. *Eggs:* 3-5, greenish blue. *Date:* May 20.

119. (761.) **American Robin** (*Merula migratoria*). *Local status:* Our most abundant summer resident, of not infrequent occurrence during winter. *Site:* In a variety of situations, most frequently in fruit or shade trees, 5-30 feet from the ground. *Eggs:* 3-5, greenish blue. *Date:* April 20. Group, Hall No. 308.

120. (766.) **Bluebird** (*Sialia sialis*). *Local status:* Common summer resident, not rare in winter. *Site:* In a hollow tree or bird-house. *Eggs:* 4-6, bluish white. *Date:* April 10.





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AMERICAN MUSEUM OF NATURAL HISTORY

# Primitive Art



SUPPLEMENT TO AMERICAN MUSEUM JOURNAL

VOL. IV, No. 3, JULY, 1904

Guide Leaflet No. 15

# American Museum of Natural History

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# Primitive Art.

A Guide Leaflet to Collections  
in the  
American Museum of Natural History.



**GUIDE LEAFLET No. 15.**

SUPPLEMENT TO THE AMERICAN MUSEUM JOURNAL,

VOLUME IV, No. 3, July, 1904.

Published by the Museum,





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## INTRODUCTORY NOTE.

A VISIT to the ethnological halls of the Museum shows that the primitive tribes whose manufactures are exhibited in the cases delight in ornamenting all the objects which are used in ordinary life, in festivals and in sacred ceremonials. Many of the ornaments may seem crude to our taste, but undoubtedly they are applied to the objects for the same purpose as that for which we apply decorative ornamentation.

Studies of the forms of primitive decoration, which have been carried on by many students, demonstrate the fact that almost everywhere decorative designs, no matter how simple their forms may be, are significant. In many cases we find animal forms and plant forms used for decorative purposes, and in these the significance is at once given by the design. In other cases the ornament consists of nothing but geometrical elements, such as straight lines, triangles and rectangles, or curves and spirals. These designs also are interpreted by primitive man as representing certain natural forms, and thus they express definite ideas.

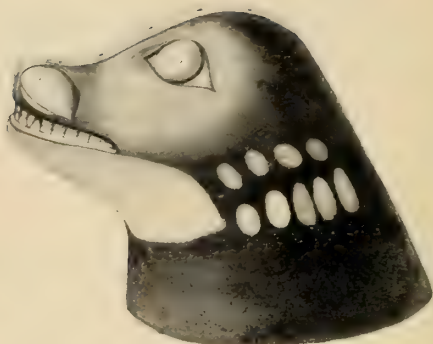
It may therefore be said that most primitive decoration is symbolic. The style of decoration by means of which ideas are expressed differs very much in various parts of the world. The groups of ideas that are expressed by ornamental designs are also different, according to the characteristic culture of each tribe.

The collections to which this Leaflet refers may be found in Halls 108, 102 and 202. Their location in the halls is marked on the accompanying plans.





DYING WARRIOR



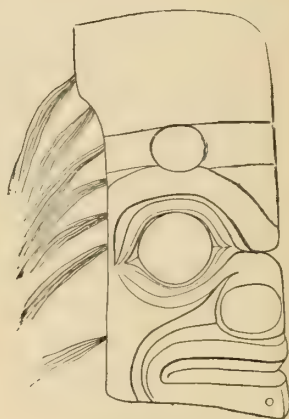
SEAL



BEAVER



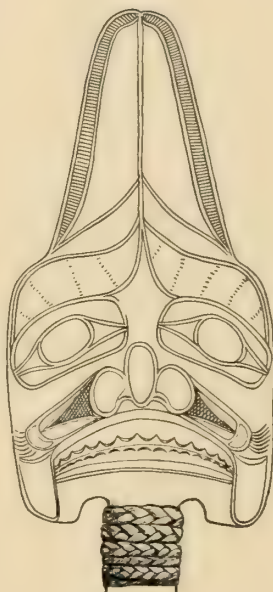
PUFFIN



KILLER-WHALE



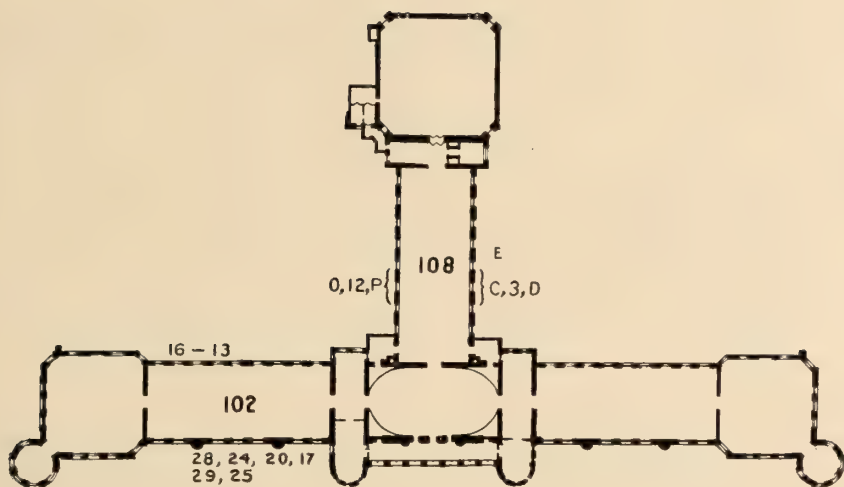
SCULPIN



DOG-FISH



SQUID



FIRST FLOOR, HALL 108.

#### CASES C, D AND 3.

THE COAST TRIBES OF ALASKA AND BRITISH COLUMBIA.—These tribes use throughout animal forms for purposes of decoration. Some of their masks show that they have the power of producing good realistic representations of human and animal forms (Case C 12); but more frequently the characteristic forms of the animal to be represented are exaggerated in size, as, for instance, the beak of the hawk and the incisors of the beaver.

Sometimes the characteristic feature is represented alone, and thus becomes the symbol of the animal. In Case 3 *c* the symbols of several animals are exhibited. The beaver, which is shown in the upper right-hand corner, is characterized by two large incisors, by a broad tail on which scales are indicated by means of hachure and sometimes by the stick which it holds in its paws. The killer-whale is symbolized by its long dorsal fin; the shark or dog-fish, by its long, pointed snout, which is represented as rising over its forehead, by its large mouth with depressed corners and many teeth and by the gill-lines which appear on its cheeks. The sculpin is symbolized by spines which rise over its mouth; the eagle, by its crooked beak; the squid, by the suckers which

appear attached to the eyebrows or to other parts of the body; the raven, by its long beak; the sea-monster, by its large head and by flippers attached to its elbows.



The method of distorting the animal form in order to make it fit the decorative field is illustrated in the specimens in Case C 13. The decorated wooden dish in the bottom of the case represents an animal. It is so shown that the front of the dish represents the animal's head; the sides of the dish, the sides of the body; while the narrow end in the rear represents the tail.

Thus it will be seen that the dish actually represents the body of the animal hollowed out from the back. The animal forms are placed in a similar manner on painted hats, as on the one here illustrated; the whole animal being laid around the conical hat, and, as it were, being pulled over the head. In some cases the adaptations require material changes in the form of the animal. When, for instance, a fish is to be painted or carved on the front of a square box, the body of the fish must be so distorted as to fill as nearly as possible the whole decorative field. This is done by cutting the fish along its whole back from head to tail, by exaggerating the size of the head, twisting half of the body along each side of the decorative field and placing the tail so that its



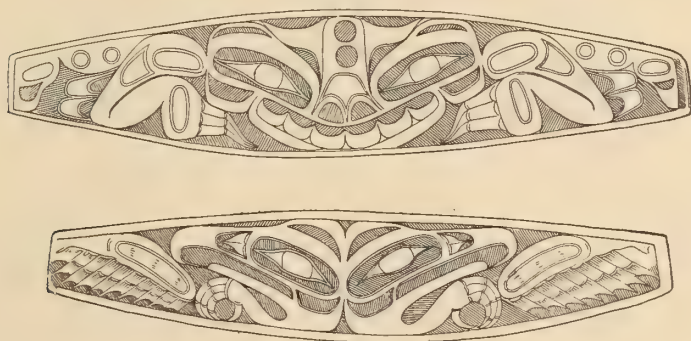
end comes just under the head. In still other cases the form of the decorative field necessitates great reduction in the size of certain



parts of the body. Thus we find in Case 3c a blanket-border representing a sea-monster. The animal is shown split in two along its back; but all its parts — except its head, the paws and the tail — are much reduced in size. The teeth are indicated by



a series of slanting lines under each eye, but the lower jaw has been omitted. The body is represented by a fine line extending from the lower outer corners of the eye, around, then along the upper margins and finally down again. The arms and the fins, which are believed to be attached to the elbows of the monster, are of very small size, while the paw is painted on a very large scale. The wide strips in the fringe represent the dorsal fins of the mon-



ster. This reduction of parts of the body has evidently given rise to the elimination of all except the characteristic symbols, whenever this was necessary. We find a similar reduction of the sea-monster design on a bracelet in Case C 13, the design of which is shown above, and the complete omission of parts of the body on another bracelet representing the eagle, of which only head, talons and wings are shown.



Sometimes, in the effort to bring the animal form into the decorative field, the animal is dissected and distorted in a most astonishing manner. This is particularly true in the case of the large ceremonial blankets woven by these tribes, in which various parts of the animal body seem to be combined in the most irregular manner, although really each part represents a definite portion of the animal represented. The blanket above Case D 3 and the explanatory model in that section illustrate this dissection. Similar distortions occur in paintings. For instance, in the copy of a painting from a house-front (Case D 3), representing the killer-



whale, the central part of the figure represents the head of the whale. The flippers are shown close to the corners of the jaws, half of the blow-hole and half of the dorsal fin in the right and left hand upper corners, while the tail is shown just over the head.

A collection of designs representing various animals, indicated by their symbols and distorted so as to fit the decorative field, is shown in the exhibition cases. The lower part of Case 3 *c* contains representations of the dog-fish or shark. Case 3 *b* contains representations of a mythical sea-monster. In Case D 1 the sea-lion, sculpin, raven, crane, frog and seal are shown. Case D 2 contains representations of the beaver, all of which are characterized by the large incisors and the tail with hachure. Case D 3 contains representations of the killer-whale, characterized by

the long dorsal fin; D 4, representations of the bear, which is characterized by its large mouth, often represented with protruding tongue, and its large paws; D 5, those of the raven; D 6, those of the thunder-bird or hawk and the eagle, the thunder-bird being characterized by the hooked beak, which turns back into the mouth.

One of the peculiar characteristics of the decorative art of the North Pacific coast is the frequent occurrence of the "eye." A form similar to an eye, consisting of an inner and an outer circle, is applied to indicate all joints, evidently to signify the socket and the head moving in the socket. Often this eye is elaborated as a whole face, which then makes the interpretation of the animal form very difficult.

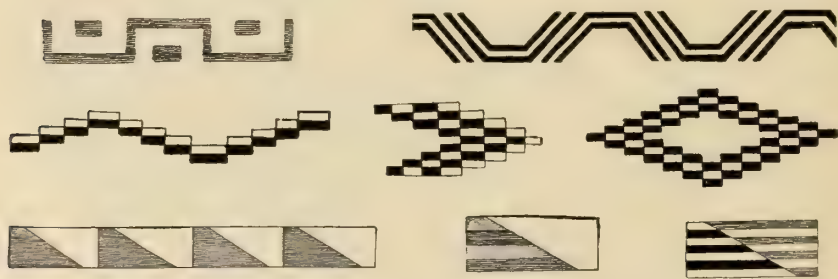
The essential features of the decorative art of the coast Indians of Alaska and British Columbia may thus be characterized as a representation of animal forms by means of distortion and omission, the decorative forms being somewhat realistic representations of parts of the body, preference being given to those parts which are symbolic of each animal.



Purely geometrical decoration is found in only one place on the North Pacific coast. It is applied to the basketry of the Tlingit Indians (Case E 3-8), who, however, in their painting and carving, use

the style of art described before. This geometrical style was probably developed in imitation of the porcupine-em-

broidery of the tribes of the interior. Most of the ornamented baskets are made of spruce-root, and are embroidered with grass. The ornaments are generally arranged in two broad parallel stripes of the same design, separated by a narrow band containing a different design. The motives consist of rectangular and triangular forms. The people interpret each motive as the representation of some realistic object. The meander pattern is interpreted as waves and as objects floating in the waves, while a similar design executed in obtuse angles is interpreted as the



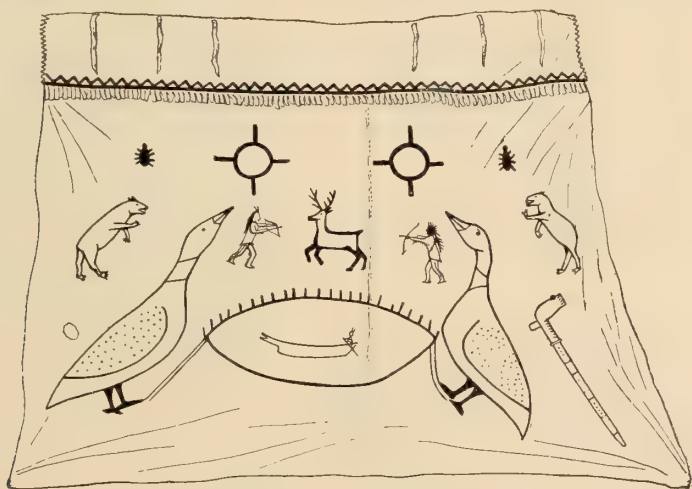
butterfly. Diagonal rows of small rectangles are interpreted as a string tied around the basket, while two such lines meeting in a point are interpreted as flying geese; and a diamond made up in a similar way represents goose-tracks. Rectangles divided diagonally into two sections are interpreted as bear's feet, one half representing the sole of the foot, while lines in the other indicate the claws. In many cases, both the design and the figure cut out of the background are given names.

It is important to note that the interpretations given to the designs on some baskets seem to be entirely disconnected. This suggests that the combination of the patterns has no distinct symbolic significance, but that the so-called "interpretations" are rather pattern-names.



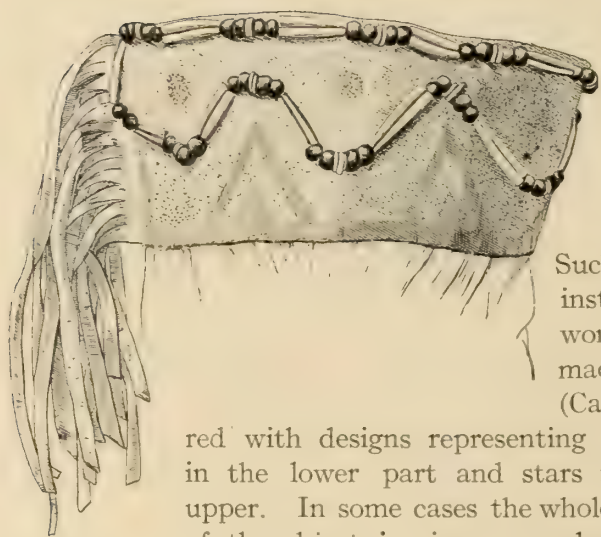
## CASES O, 12 AND P

COAST TRIBES OF WASHINGTON AND TRIBES OF THE INTERIOR OF BRITISH COLUMBIA.—The general character of the decorative art of this region is entirely different from that of the coast tribes of Alaska described before. The ornamentation applied by the tribes of the interior to their garments and to objects of every-day use is throughout pictographic; that is to say, it consists of realistic representations of natural objects, which are connected, and tell a complete story. We notice, for instance, on a painted blanket



in Case 12 f, a number of animal and human figures. A mountain-range rising on the earth is shown above the fringe. On the upper part of the blanket, two suns are shown, outside of which are two beetles. In the center is a stag pursued by two Indians. The figures near the right and left margins are grizzly bears. On the lower part of the blanket two loons are shown. These are painted on a large scale because they are the guardian spirits of the wearer. Between them there is a lake with trees around one side, and a canoe and a man in the center. Trail-lines between the loons indicate that they belong to the lake. The owner's pipe is painted on the lower right-hand corner. The idea expressed by these figures is a prayer for success in hunting on mountain and lake. The hunters and the canoe-man represent the wearer of the blanket; the suns, beetles and loons are his guardian spirits.





In many cases these pictographs become more geometrical in character, so that they may be called ornamental designs.

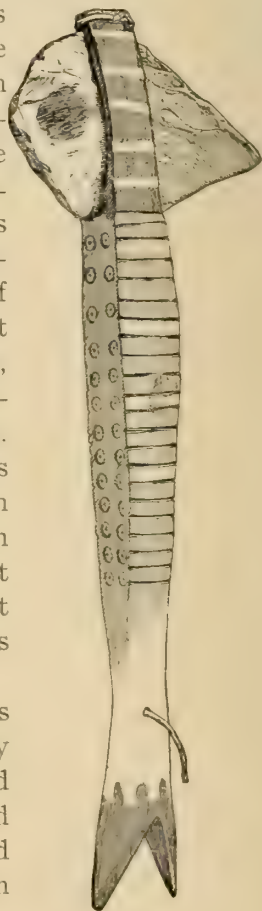
Such is the case, for instance, in a young woman's head-band made of buckskin (Case 12 *d*), painted

red with designs representing lodges in the lower part and stars in the upper. In some cases the whole form of the object is given a symbolic interpretation. Thus we find a stone war-axe (Case 12 *c*) representing the woodpecker. This design symbolizes the idea that the point of the axe is to be as powerful in piercing skulls as the beak of the woodpecker is in piercing the bark of trees. The point of the axe represents the beak of the bird; the red dot on the rounded part of the stone, its eye; the handle, its body. In the pictographic art of this tribe, certain motives have obtained a conventional meaning.



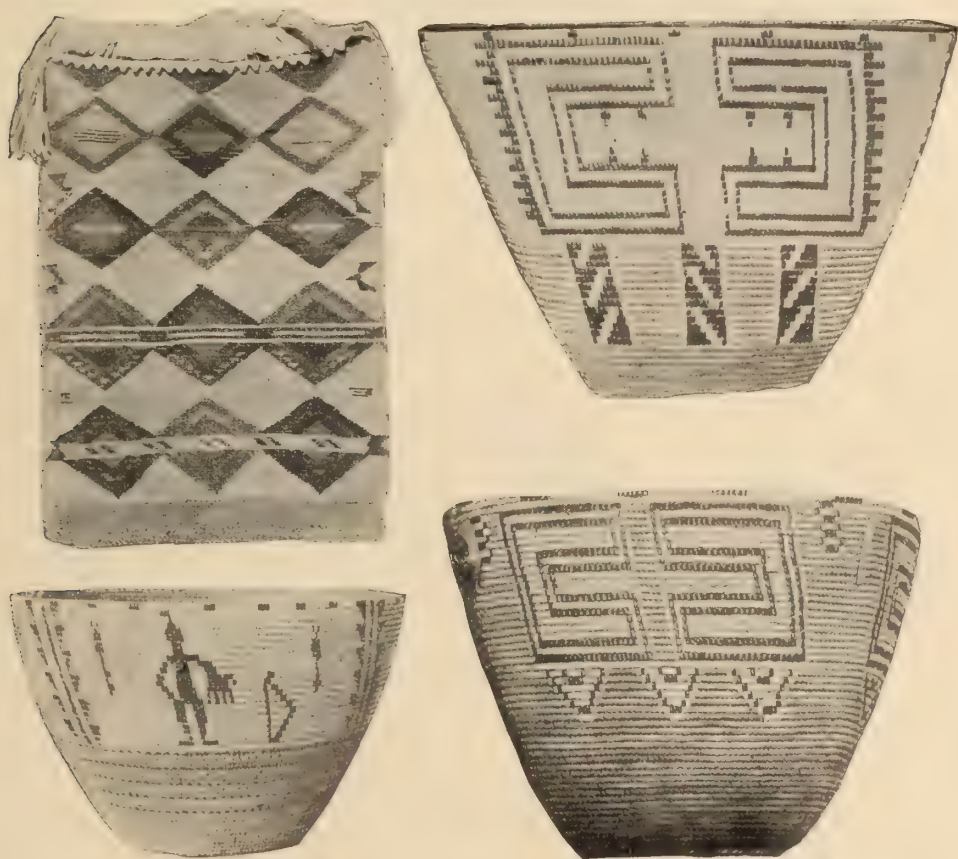
Such is the case, for instance, with the triangles on the girl's head-band mentioned before, which always represent lodges. Crosses, like those on the drinking-tubes in Case 12 *d*, represent the crossings of trails; parallel lines represent ditches, and a circle with four equidistant rays symbolizes the sun.

The pictographic art of these tribes tends to assume a geometrical character particularly on their woven bags and on their imbricated basketry. The merging of the pictographic and purely decorative elements may be observed very clearly in a bag (Case 12 *d*), on which



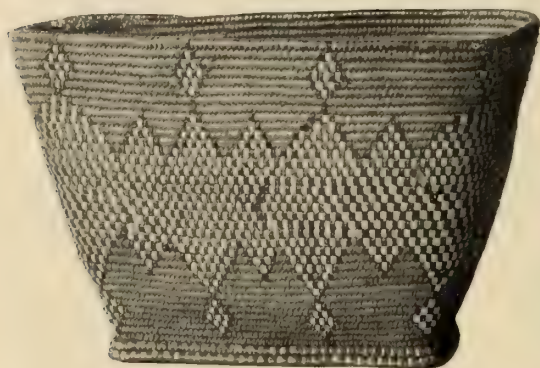


a series of diamonds represents isolated lakes, and lakes connected by streams. Near these lakes are shown ducks flying towards the water. Designs half pictographic and half geometrical may also be seen on the baskets in Case O 9, in which the figures of birds, men and dogs may be recognized. A



striking interpretation is given for two baskets in Case O 11. The peculiar rectangular forms which face each other are each interpreted as a head. In one of these, the short lines on the back represent the hair, while the two pairs in each opening represent teeth. In the other one these attachments have entirely disappeared, but the form is still interpreted as that of two heads facing each other.

A great variety of geometrical forms may be observed in these baskets (Case P 1-3). Almost all of them are also given realistic



interpretations. One interesting basket, the design of which consists of alternating large and small diamonds, is explained as the beaver design, the large central pattern being interpreted as the body of the beaver; the small diamonds at the lower end, its

tail; the one at its upper end, the head; while the black lines forming one side of the intermediate diamond are the fore and hind legs of the animal.

It is fairly evident that this type of basketry has influenced that of the coast tribes of Washington, who also have geometrical designs on their baskets. We find among these tribes a good many baskets imported from the interior, while their own baskets



show a different type of manufacture, but somewhat similar designs. Here a meandering pattern is interpreted as ripples of water, while a design consisting of zigzags is interpreted as mountains and valleys (Case O 7). Attention is called to the peculiar designs composed of hooks (Case O 8), which will be

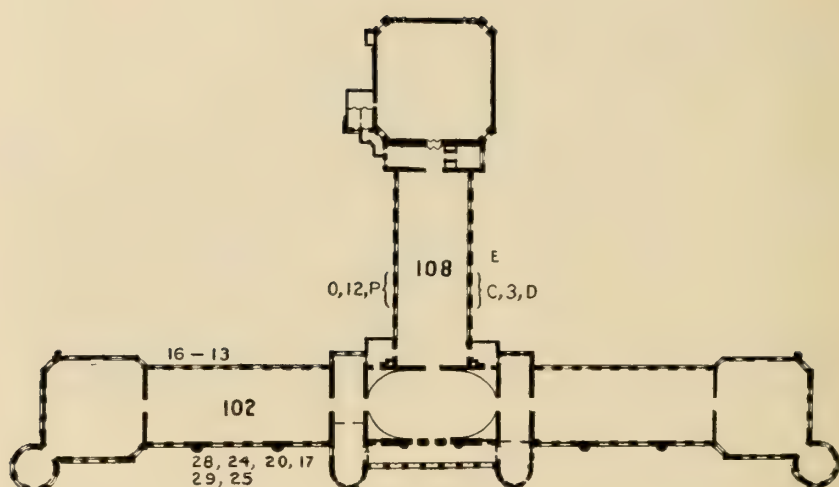
referred to in the description of Californian designs. These designs also occur in the basketry from the interior of the State of Washington (Case R 12).

The forms which we observe on the coast of Washington have also influenced the type of basketry of the tribe of Cape Flattery, a branch of the Nootka, whose culture is similar to that of the more northern coast tribes. Among them we find many fine baskets with geometrical designs (Case N 10). These baskets are made on a foundation of cedar-bark, while the designs are executed in colored and bleached grass-stems. Most of the designs resemble in character the geometric designs of the southern coast tribes. It is, however, peculiar to



this tribe, that on some of these baskets, whaling and fishing scenes, with canoes and their crew, are represented. Such scenes were also used in the ornamentation of the old type of hats that were worn in the eighteenth century, but which have gone out of use.





FIRST FLOOR, HALL 102.

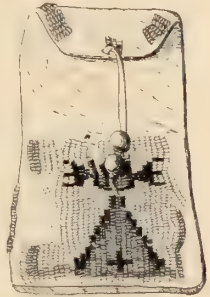
#### CASES 17-29

PLAINS INDIANS.—The decorative art of the Plains Indians resembles in some characteristic features that of the tribes of the interior of British Columbia, although its technique is much better and more elaborate. Its fundamental character is pictographic. In objects which serve ceremonial purposes, this character is strictly maintained. Thus we find on buffalo-hides which are records of events, and even on blankets, pictographic representations of battle-scenes, or of other events in the daily life of the Indian. On garments used in ceremonial dances, paintings occur which represent birds, sun and moon, and are similar in character to those described before.

These, however, are not, strictly speaking, decorative designs. In most cases where ornamentation is the prime object, the forms which are utilized are arranged more or less symmetrically; and with the development of symmetry we find that the occurrence of realistic forms disappears. Almost all the decorative work of the Indians of the Plains is made in bead-embroidery, and is

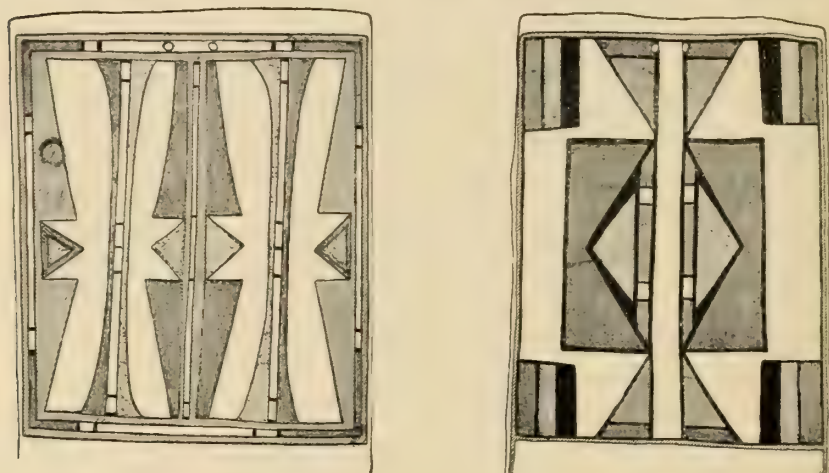


probably an outgrowth of the embroidery in porcupine-quills which was characteristic of the Indians before they came in contact with the whites. The forms which are the constituent elements of decorative motives are very simple and characteristic. They consist throughout of regularly arranged triangles and rectangles, mostly in brilliant and strongly contrasting colors, and often also showing sections of varying color. Sometimes the decoration is applied to the whole surface, sometimes only a particular part of the object is decorated. Much of the painting is done on rawhide, but most of the embroidery is made on soft skin. The background of the painting is usually rawhide, while the beaded designs are often set off against a background of white or colored beads.



The manner of combination of triangles and rectangles is so peculiar, that decorated objects obtained from the Plains Indians can readily be distinguished from objects from any other part of the world. Although there is a certain sameness among all of them, each tribe has certain peculiarities of its own. The most characteristic form, which occurs over and over again in Indian decorative art, is the somewhat pointed triangle, either divided into halves of different color, or including another triangle of different color. This form is generally explained as the tepee, the tent of the Plains Indians. Another form which is almost as frequent is a very obtuse triangle, often with a small rectangle in the middle. This is interpreted as a hill, while the center figure is often called a cave in the hill. We find also very often designs consisting of parallel lines, sometimes broken up by equidistant short patterns of different color. These lines are generally interpreted as trails; and breaks in the lines, as camping-sites or other interruptions of the continuous trail.

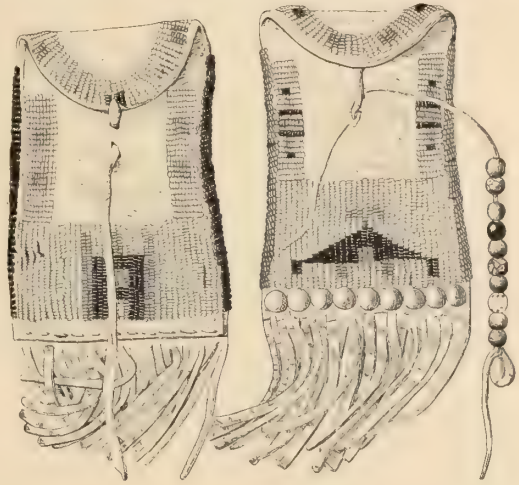
The decorative forms applied by the Indians may, on the whole, be described as a variety of combinations of the acute tent triangle and of the obtuse hill triangle with rectangles and straight



lines. Circles divided into sections occur also quite frequently. All these forms are executed in a variety of color, which is generally included in the symbolic interpretation of the design.

The detailed arrangement of the decorative motives shows some characteristic differences among different tribes. Thus, we find that the Arapaho (Case 20 *h*) like to arrange their patterns on hide bags in a number of parallel stripes, and that in the painted designs they put on the color in rather small areas. The Shoshone (Case 26 *e*), on the other hand, like to arrange the decorative field in such a way as to lay out a wide border which cuts out a central field. The designs in these areas are laid on in strongly contrasting colors, without leaving any white background to speak of. Similar differences may be observed in the bead-work of different tribes. Some — for instance, the Comanche (Case 26 *d*) — prefer to arrange their patterns in delicate narrow bands; while others, like the Sioux, utilize large beaded surfaces. These may be observed on moccasins, bags and pouches, on which white or colored beads form the background, from which the designs are set off. It seems, however, that some beaded and painted designs are common to all the tribes of the Great Plains.

*Interpretation of Arapaho Designs.*—The characteristics of Indian interpretations will best appear from a description of a few specimens. The square design near the lower edge of a small pouch (Case 20 e) is the bear's foot, generally conventionally represented by the Arapaho with only three claws. Square pink spots on the body of the design are the bare skin on the sole of the foot. The white bead-work is sand or soil. The curved band on the flap is a mountain. The leather fringe at the bottom of the



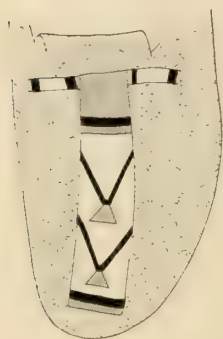
pouch represents trees.

White beading on another pouch represents sand: the green beads at the edges, on account of their color, represent timber; two compressed crosses, the morning star; and squares on the flaps, rocks. The large figure near the bottom is a mountain with a tree on its summit. Below it are four small red and blue rectangles, which denote little streams flowing from a spring near the foot of the mountain. The spring is represented by a green square in the large triangle.



Paint-pouches amulets and head-ornaments are often given animal forms. The pouch illustrated here represents a lizard. The large ornament at about the middle of the bag represents a butterfly. The triangles are its wings, and the rhomboidal figure of bead-work projecting on the leather surface is its body. On the flap is the dragon-fly. The detached, somewhat triangular figures at the sides of the dragon-fly are its wings.

On an Arapaho moccasin (Case 20 *h*), a wide stripe embroidered on the instep represents the path on which the wearer travels. The two pieces of the transverse stripe, which duplicate in minia-

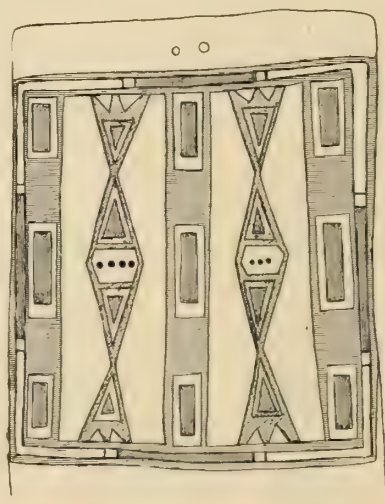


ture a part of the main stripe, are insects or worms which the wearer desires to avoid, and which, for this reason, are placed by the side of his path. The upper portion of the large stripe is light blue, which signifies, as in many other cases, haze. The red and dark-blue bands that edge the white portion of the stripe represent day and night. The winged triangle, which appears twice, signifies sunrise, and also the passage over a mountain.

The explanation of painted designs of the Arapaho is quite similar to that of beaded designs. Thus, on one hide bag (Case 19 *c*) three wide blue stripes represent rivers, both form and color being symbolic. The red rectangles in them are islands, and the white border around these is sand. The triangles are bears' feet; the red portions of the triangles represent the bare skin of the sole of the foot; the projections at the base of the triangles are the claws. The unpainted background represents the prairie; the black spots in them are coyotes. Blue lines enclosing the whole design are buffalo-paths; the white lines between them, antelope-paths; the yellow line is an elk-path; and red lines are deer-paths.

It will thus be seen that the interpretation of the designs given by the Arapaho is partly realistic, while a part of the designs express abstract ideas.

The morning star, the life symbol, the path of life and other concepts which are intimately associated with the religious ideas

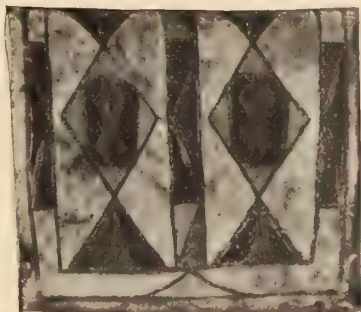




of the people appear frequently in their interpretations of their designs. Purely animal forms are, comparatively speaking, rare; while geographical features,—such as mountains, valleys and rivers,—tents, parts of the body and plant designs occur very frequently.

#### CASE 17 c.

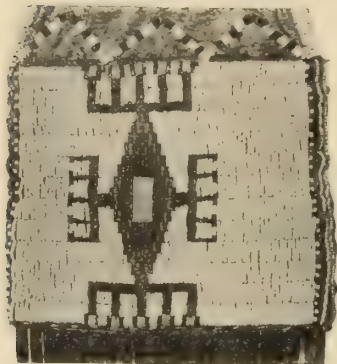
*Interpretation of Blackfoot Designs.*—Among the Blackfoot we find the same type of decorative designs as among the Arapaho, triangles and diamonds being the most important elements, but they are purely decorative, without symbolic significance. These geometric forms, however, have pattern-names as constituent elements of the complex designs, for example: the diamond-shaped figures are known as “spavin” patterns. The idea is, not that the design represents a “spavin,” but that it resembles this affection as it appears upon a horse’s foot.



#### CASES 24, 25.

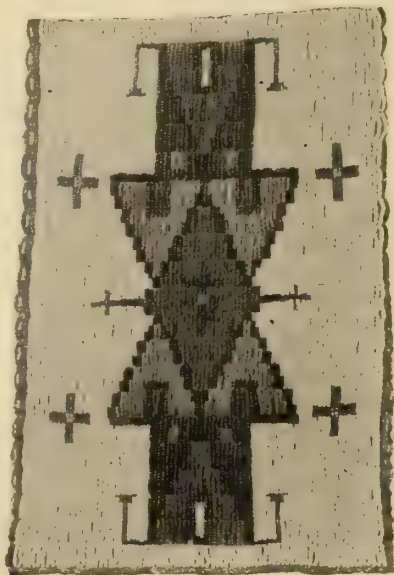
*Interpretation of Sioux Designs.*—The decorative art of the Siouan tribes comprises geometrical designs in bead-work, and pictographic designs in paintings. The geometric designs are both symbolic and decorative. The pictographic designs are usually symbolic. Most of the geometric designs are made by the women; the pictographic, by the men. The art of the women is especially interesting, because we find them using simple geometrical forms as design elements, for example: all triangular designs of a certain size are known as “tent” patterns; all rectangular designs are known as “bag” patterns; all small triangular designs are known as “point” patterns, or “leaf” patterns; diamond-shaped designs are known as “arrow-point” patterns. Complex geometrical designs are built up from these simple elements, and the names given above are the technical names for these designs. The complex designs are best represented in the decoration of tobacco-pouches, as illustrated in Case 25 a.

These complex designs, taken as a whole, often have special names, for example: a diamond-shaped figure with forked appendages, as shown in the adjoining illustration (Case 25*a*), is sometimes



spoken of as the "turtle" design, or "turtle" pattern. So far as the makers of these designs are concerned, the name "turtle" is simply the pattern-name, and in no wise a representation of the animal specified. Thus we have a series of decorative designs in which the motive is not the representation of objects or ideas, but merely an appeal to the æsthetic sense. However, these design elements may be combined into wholes which do

represent definite objects or ideas, and so become symbolic designs; but the use of designs to represent any particular idea does not conform to any rule, it depends rather upon the fancy of the maker. A good example of this type of design is illustrated below (Case 25*a*). It represents a decoration seen by the maker in a dream. It is thus a picture of the dream design. But there are certain geometrical forms which are symbolic, and are looked upon as sacred. One of the most common of these designs is that of a spider-web, which may be seen on the pouch shown on p. 25 (Case 25*c*). This design is looked upon as too sacred to be used for mere decorative purposes.



There is another type of design midway between the sacred symbolic one and the merely decorative one, such as the design of the turtle upon the dresses of women. This is simply a U-shaped figure placed on the breast

and the back. It appears on most of the beaded dresses, and is placed there partly for decoration, and partly because it is the prevailing style. The old women know that in former times the design of the turtle was placed on the dress as a kind of prayer to the mythical turtle, who was believed to be the guardian spirit watching over the lives of women. Now they say that the design is placed on the dress simply because "that is the way." Thus we have a design which was formerly sacred and symbolic, but is now chiefly decorative. The painted decorations upon the buffalo-robcs of men and women are of this type also.



In general, the decorative art of the Sioux presents three types, or perhaps stages, in the development of primitive art, — a purely decorative type, a purely symbolic type and an intermediate conventional type. The men employ the same simple and combined geometrical designs as are used by the women, but for the presentation of military ideas. Thus, the moccasin (Case 24 g) shown here represents a battle in which the wearer participated. The triangular designs around the sole (the tent pattern) represent hills; the small rectangles (the box pattern), enemies standing between the hills; the small marks upon each hill design, bullets striking. The in-step of the moccasin is colored red to represent blood, and the triangular design within the red area represents an arrow. The idea

to be conveyed is, that the owner engaged in a battle in which the enemy took refuge in the hills, and that blood was shed.



Thus we have among the same people identical geometrical designs, with identical technical names, used to convey different ideas. The military symbolism of the men differs from the symbolism of the women in one respect, namely: that any one familiar with the mode of presentation can interpret the designs used by men with considerable exactness.

In a general way the interesting characteristic of Sioux art is the existence of two schools, — that of the women and that of the men, — each of which makes use of the same design elements, but to different ends.

#### CASES 28, 29.

TRIBES OF THE EASTERN WOODLANDS.—Very little of the ancient art of the Indians of the eastern woodland area remains. Under the influence of modern patterns, the old style of porcupine-quill and bead-work has practically disappeared, and plant-



patterns have taken its place. Only on woven pouches and mats do some of the old patterns persist. These designs are partly of geometrical character; partly they consist of very stiff conventional reproductions of animal and human forms (Case 29 a). The favorite design seems to be that of a bird with spread wings,

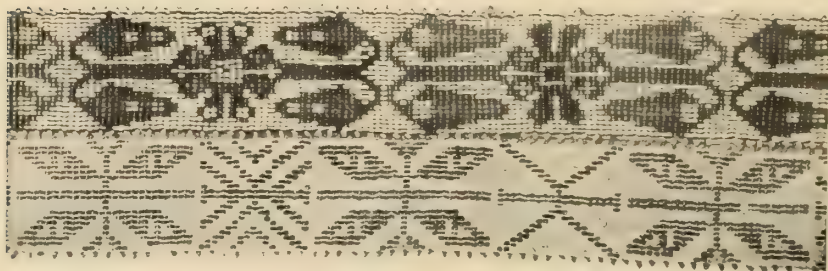


the shape of which has also influenced the manner of representing the human form (Case 28 *c*). The geometric designs (Cases 28 *e*, 31) are mostly arranged in bands, and consist of triangles, zigzags and diamonds, which show only slight relation to those of the Indians of the Plains, while they remind us somewhat of the designs of the Indians of the State of Washington. We may perhaps recognize in some of the triangles with points under their bases the tent design so common



among the Plains Indians. The whole make-up, however, of the geometric forms is quite distinctive. If there ever has been any interpretation of these geometric designs, it seems to have been forgotten, and the designs are considered purely as ornamental, not as symbolic. The only striking exception is the same spider-web design that we find among the Sioux Indians, and which occurs here practically in the same form. (Case 28 *h*.)

Painted decorations are much rarer among these tribes than among those of the Great Plains. In place of the hide bags, which are so common among all the Prairie tribes, hide trunks



are used which are painted with patterns similar to those described before. Probably these hide trunks are modern forms of ancient bark boxes.

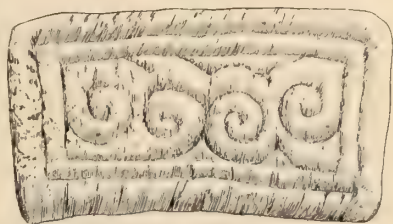
It is interesting to note that in the modern woven beadwork of these tribes the realistic flower designs which have been in vogue for a considerable period tend to assume geometrical shapes. The series of beaded belts exhibited in Case 28 *h* brings out clearly the fact that the leaves and fruits tend to assume the forms of diamonds, while the flowers tend to develop in the direction of crosses. The two beaded belts, illustrated above, show types of conventionalization of modern flower designs.





CASES 14, 16.

TRIBES OF THE AMUR RIVER.—The Gold, who inhabit the Upper Amur River, belong to Tungus stock, while the Gilyak of the Lower Amur River and of the Island of Saghalin form an independent group. The decorative art of these two tribes is almost identical. The fundamental forms are geometrical designs, consisting almost exclusively of spirals and of other curves,—a style of decoration widely spread in other parts of the Old World. In this particular region its occurrence is undoubtedly due to the influence of Chinese decorative art. The spiral ornaments are used in carving, in designs cut out of birch-bark and in embroidery. They are also applied in etched and inlaid ornaments on iron spears (Case 16 *a*). The most characteristic feature in

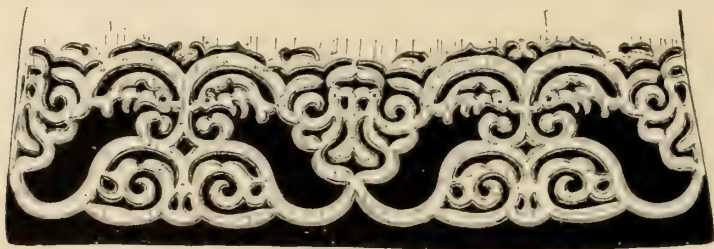


the elaboration of this motive is its combination with bird and fish designs. The cock particularly is a favorite pattern, and appears in combination with the spiral. On a fish-skin garment of the Gold may be seen a series of designs, at the top of

which is shown a crowing cock; other cocks are placed at the end of a horizontal band. On a birch-bark basket (Case 16 *e*) the same combination of designs appears very clearly, the curved ornament enclosing quite a number of cocks and fishes. Other

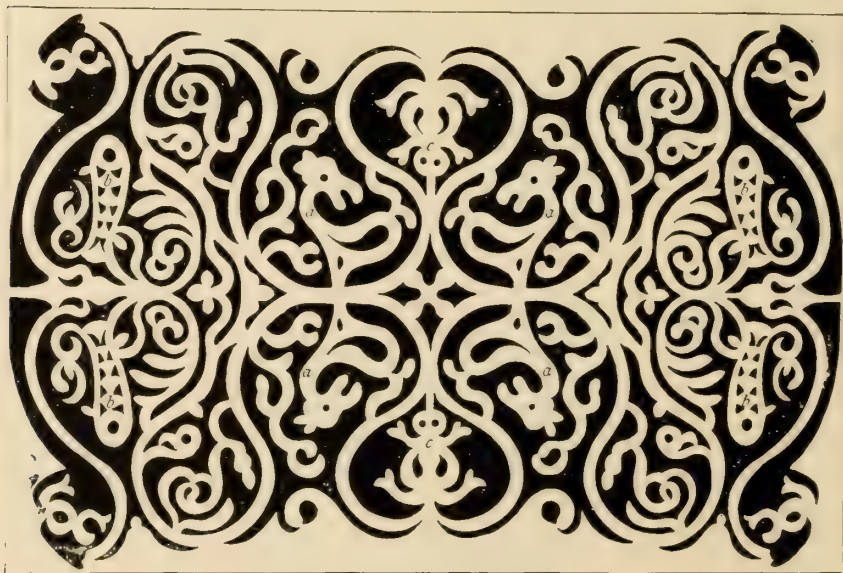


animals are not found as often as the two here named; but in a number of patterns exhibited in the turning-frame on the north wall of the hall, combinations of a variety of animals may be



found. In one of these, illustrated below, are represented four musk-deer (*a*), two frogs (*c*) and a number of fish (*b*).

While many of these forms are fairly realistic, in other cases the animal form is so highly conventionalized that it can be recog-



nized only because it is known to the natives as a symbol of the particular animal. Thus the spirals in a birch-bark basket (Case 16 *c*) are explained as two cocks which stand back to back; the point marked *a*, in the illustration beyond, being the beak of



the cock, while the oval (*c*) is an object which it is supposed to hold. This object is found in a great many representations of the cock, and may be said to be one of its prime characteristics. The tail of the cock has the form of a fish, and is shown at the point *b*. The center of the second set of spirals (*g*) has the form of a fish, which is always symbolized by a small circle attached to an elongated body.

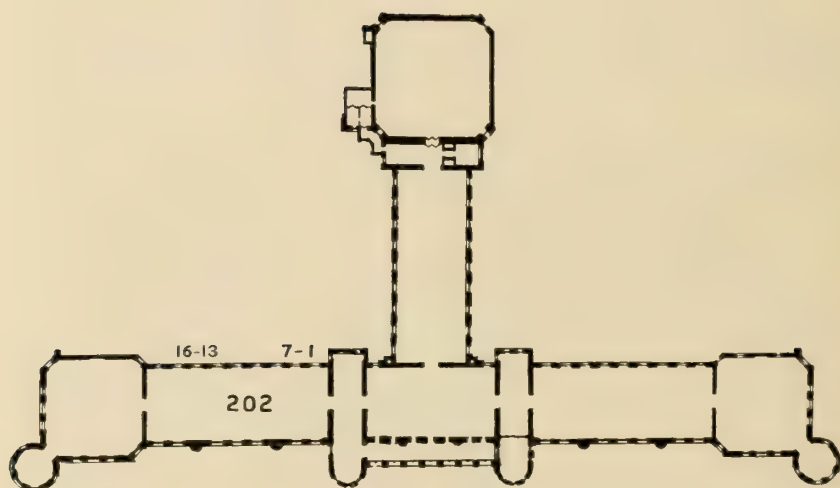
It is very peculiar that practically all the spirals and curved designs of these tribes have been developed into the cock motive, because the cock was not known to the tribes of the Amur River until quite recently. The use of this motive, and particularly also the frequent occurrence of the round object which is in its beak, indicates



that this motive is of foreign origin. It is evidently the same as the cock in China which holds the sun in its beak.

It is interesting to note that, among this tribe also, the form and ornamentation of objects used in religious ceremonials are much more realistic than purely decorative motives. Thus we find the coat of a shaman (Case 14 *c*), on which is painted a mythological representation of the world-tree, representing the conception of the world that is current among the tribe.

Going back through Hall 102, the visitor passes the Eskimo collections, and attention is called to the fact that very few implements and objects made by the Eskimo are decorated, except their clothing, which bears designs of dark and white caribou-skin.



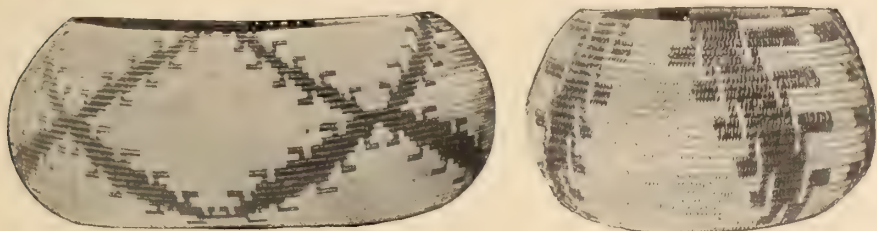
SECOND FLOOR, HALL 202.

On the second floor are found collections from California and Mexico which illustrate some of the characteristics of the decorative art of these regions.

#### CASES 1-6.

CALIFORNIA INDIANS.—The decorative art of the California Indians, more particularly that of the Indians of southern California, is almost entirely confined to basketry. Their baskets are mostly round, rather rarely oblong, many of them quite shallow: consequently we find a tendency to arrange the decorative designs in radial groups or in spirals. The designs themselves are rarely realistic, but consist always of more or less intricate geometrical designs. The similarity of these designs on various baskets is quite striking. Their interpretations, however, differ considerably. A collection illustrating the similarity of design and the diversity of their meaning has been assembled in Case 2 *a, b*. There we find on one basket a design representing a squirrel's foot. A similar design on another basket represents mountains and pine-cones; on still another, the bear's foot; and on a fourth the owl's claw.

In the same case are shown a number of baskets illustrating one of the most common ornamental motives found in California,



the so-called "quail-tip," a design consisting of a slender line with a small heavy hook standing off from the end at right angles. This design was described before as found on baskets from the State of



Washington (Case R 12 in Hall 108), and it seems probable that it has spread along the Pacific coast from tribe to tribe. This

seems the more likely, since it is found in entirely different weaves, according to the district in which it occurs. While it is found on many Californian weaves, it is applied in the State of Washington on the peculiar imbricated basketry the characteristic designs of which are illustrated by baskets of the Thompson and Lillooet Indians (see p. 15 and Cases O and P, Hall 108).

The interpretations given to designs by the Californian Indians vary greatly. The designs often represent plants, while some represent fish-teeth, snakes, worms, millepedes, butterflies, etc. Designs symbolic of larger animals are absent. One of the most frequently occurring designs on Californian, and perhaps on all basketry, is the feather and arrow-point design (Cases 2, 3). Realistic designs are found only in the extreme southern part of California and in the adjoining portions of Arizona.

In northern California the interpretation of designs seems to be almost absent. The patterns of this district are called "striped," "zigzag," etc., terms which are evidently names, not interpretations (Case 6 f).

#### CASE 15.

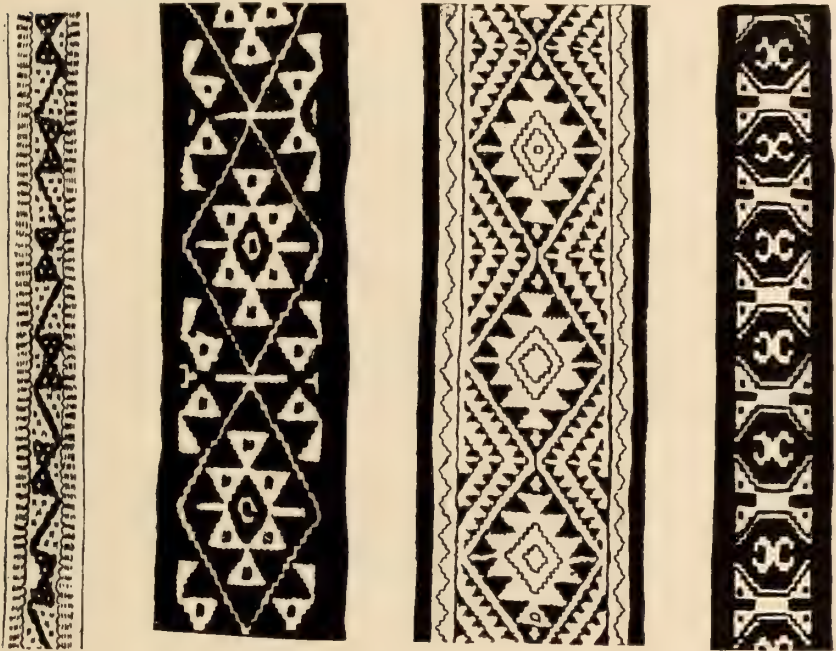
HUICHOL INDIANS, MEXICO.—The decorative art of the modern tribes of Mexico has evidently been much influenced by Spanish art. The most elaborate decorative work of the present period is done in textiles, particularly in weaving and in embroidery, while modern pottery designs are of a crude character. The designs found in various regions of Mexico and of Central America, and also those of South America, consist to a great extent of geometrical elements, but also of somewhat angular representations of birds, mammals and men, all more or less conventionalized. The color combinations differ also considerably in various regions.

One of the designs found most frequently on textile work is a series of triangles which are similar in their arrangement to the arrow design on Californian basketry. This type of design is found on the belts of the Pueblo Indians of New Mexico and Arizona as well as in Mexico. A comparison with ancient Mexican designs, in so far as they have been preserved on ancient Mexi-



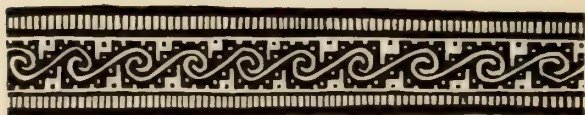
can codices, or as they may be recognized on the garments of ancient sculptured figures, shows that these types of weaving did not exist before the advent of the Spaniards and the introduction of European fabrics.

For this reason it is interesting to note that by some tribes the designs are at present given interpretations quite analogous to those found among the Prairie Indians and among other primitive tribes. A collection of belts, ribbons and pouches from the Huichol



tribe of western Mexico (Case 15), illustrates this point. The zigzag triangle, described by the Californian Indians as the arrow design, is called here the "double water-gourd" design. The Indians compare the hourglass figure, which originates from a combination of two triangles, to the double gourd, which has two thick ends and a constriction in the middle. The X-shaped form, also quite common, is interpreted as a brush made of loose fibres tied together in the middle or at one end. A series of scrolls is an element which occurs very frequently in their weav-

ing. It is called the "bridle," because Mexican bridles have on either side of the bit a figure resembling one of these scrolls.

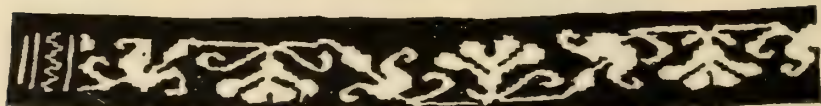
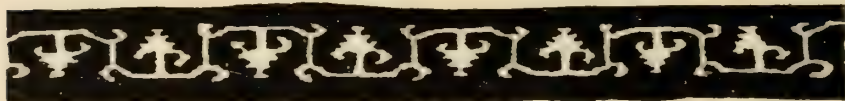


It is also interpreted as the linking of hands. The decorative element shown in the figure below is interpreted as the steel for striking fire.

It is considered as an ornamental elaboration of



the form of steel used in this region. The arbitrary character of the interpretations given by these people may be seen in the elaboration of this design, which is sometimes developed into a continuous band, and is then explained as a vine and flowers. A



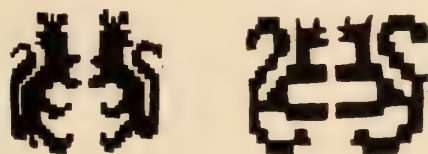
very frequent element of decoration is shown below, and is interpreted as roots of plants. The transition from these forms to more realistic ones is very gradual. The simple geometrical forms are combined into plant designs, and, in their most symmetrical arrangement, to flower designs. To these are added sometimes realistic representations of double-headed birds, of mountain-lions and of other animals. Long narrow ribbons covered with designs of this character are generally described as serpents, the design indicating the marks on the serpent's back.



A comparison of the decorative designs exhibited in Case 15 with the designs on ceremonial objects which will be found in Cases 13 and 14, shows a marked difference between the two styles. The execution of the purely ornamental objects is careful,— the



designs are regular in outline, and the conventionalism in interpretation and in form is strong. The decoration on sacrificial objects, on the other hand, is, on the whole, crude; it is throughout pictographic in character. The crudeness of these designs is partly due to lack of skill in the use of the brush and of the carving-tool, and in the application of bead-work by means of wax,— an art which is undoubtedly a survival of the ancient turquoise mosaics. All carved and painted designs of the Huichol Indians seem to be crude, and many of the embroidered designs on sacrificial objects are also poorly executed; but this may be partly due to their temporary character. A few of them, however, are carefully woven; but their designs are pictographic, not geometrical. The interpretation of the conventional decorative designs of the Huichol is, on the whole, in line with the ideas expressed on their ceremonial objects. Their constant thought is the need of rain for their crops; and the water-



gourd, the flowers, the vines and serpents are all considered as symbols of rain or of the vegetation produced by rain.

In this respect the interpretation of the geometrical designs given by the Huichol resembles very much that given by the Pueblo Indians of the arid Southwest. Some of the favorite motives of their decorative art are interpreted in the same manner, terraced triangles with lines descending from them being always interpreted as rain-clouds and falling rain; while zigzag lines represent lightning.

### SUMMARY.

The description of these collections shows that in many remote parts of the world primitive people interpret the ornamental designs which they use for decorating objects of everyday use as representations of realistic ideas. Investigations among other peoples, from whom the Museum has no collections, show that the same tendency may be found all over the world. In some cases it has been found possible to bring together a series of decorative motives which show at one end an almost realistic representation of a certain object, while at the other end of the series may be seen a purely conventional form. From this observation the conclusion has been drawn, that, on the whole, geometrical ornaments originated from realistic forms by gradual transformation.

On the other hand, we have seen that in many cases the same form was transferred from one tribe to another by borrowing, as, for instance, among the Indians of the Plains; and that different interpretations were given to the same forms by different tribes. This seems to indicate that the interpretation may also be adapted to the design, or, as we may say, that, according to the favorite concepts of the people, an idea has been "read into" the design.



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The  
Insect-Galls of the Vicinity  
of  
New York City



BY

William Beutenmüller

Curator of Entomology

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Guide Leaflet No. 16

# American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

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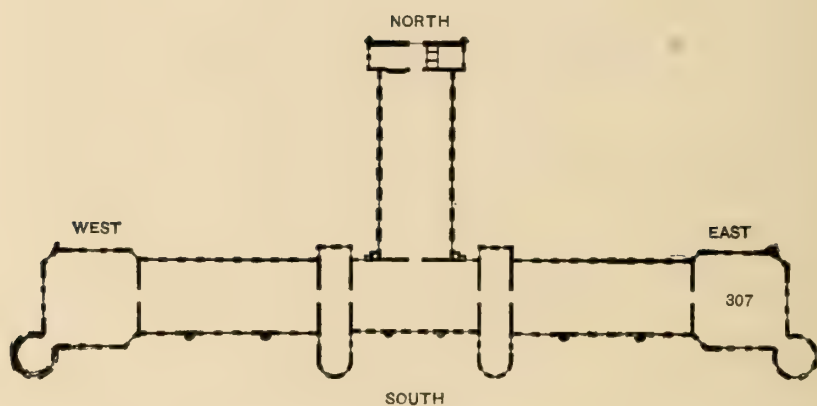
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The Insect-Galls  
of the  
Vicinity of New York City.

A Guide Leaflet to the Collection  
in the  
American Museum of Natural History,  
New York.

By  
WILLIAM BEUTENMÜLLER,  
CURATOR OF ENTOMOLOGY.

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### THIRD, OR GALLERY, FLOOR.

The collection of Insect-Galls upon which this Guide Leaflet is based is exhibited in Hall No. 307 of the East Wing, third floor of the Museum.



## THE INSECT-GALLS OF THE VICINITY OF NEW YORK CITY.

EVERYWHERE throughout the woods, along the roadsides and in the fields, one finds on leaf or twig, stem or root peculiar swellings which evidently are not part of the normal growth of the plant. These deformations when produced by insects are called Galls. Generally one or more eggs are inserted in a bud, a flower, a leaf, a root or some other part of the plant, and the presence of this foreign body, together with the irritation caused by the larva among the vegetable cells, produces an abnormal growth of definite shape and uniform structure. The variety of Galls in respect to structure and substance is great. Every species of Gall-producing insect attacks its own particular plant and a particular part of that plant. Galls are of various sizes and colors and of almost every conceivable shape. Some resemble a tomato or a potato. Some are like the apple, plum, cherry and other small fruits. Some have the appearance of a pine-cone or a seed. They are smooth, wrinkled, downy, hairy or covered with spines and other protuberances. Some are succulent, while others are so fragile that they can be readily crushed, and still others are so corky, hard and woody that it requires a sharp knife to cut them. In color they are of many shades of green, yellow, red, brown and white.

The number of Galls formed by distinct species of insects and mites is so large that only a small proportion of the excrescences or of the insects causing them has yet been described. The present Guide Leaflet gives brief accounts, illustrated by figures drawn to a uniform scale, of some of the more conspicuous Galls made by members of the following families of insects found in the vicinity of New York City:

- (1.) **Hymenoptera** (CYNIPIDÆ and TENTHREDINIDÆ)—Gall-flies and Saw-flies.
- (2.) **Diptera** (CECIDOMYIDÆ, MYCETOPHILIDÆ and TRYPETIDÆ)—Flies.
- (3.) **Hemiptera** (PSYLLIDÆ and APHIDIDÆ)—Plant-lice and Jumping-lice.
- (4.) **Acarina** (ACARIDÆ)—Mites.

#### 4 INSECT-GALLS OF THE VICINITY OF NEW YORK CITY

Besides these groups, which are the principal Gall-producers, some few species of other orders (Coleoptera and Lepidoptera) also produce Gall-like excrescences.

In the following list, the Galls which have been found in the vicinity of New York City are arranged according to the plants upon which they occur. The serial numbers refer to the descriptions on the succeeding pages.

	Species No.		Species No.
<b>Wild Rose</b> ( <i>Rosa</i> sp.).		<b>Black Oak</b> ( <i>Quercus velutina</i> ).	
<i>Rhodites bicolor</i> .....	1.	<i>Amphibolips confluentus</i> .....	14.
" <i>radicum</i> .....	2.	<i>Andricus pigra</i> .....	31.
" <i>globulus</i> .....	3.	<i>Cecidomyia pilulæ</i> .....	66.
" <i>dichlocerus</i> .....	4.		
" <i>verna</i> .....	5.	<b>Scrub Oak</b> ( <i>Quercus nana</i> ).	
" <i>rosæ</i> .....	6.	<i>Amphibolips ilicifoliæ</i> .....	16.
" <i>ignota</i> .....	7.	<i>Andricus punctatus</i> .....	20.
" <i>lenticularis</i> .....	8.	" <i>similis</i> .....	24.
		<i>Cecidomyia pilulæ</i> .....	66.
<b>Trailing Blackberry</b> ( <i>Rubus canadensis</i> ).		<b>Rock Chestnut Oak</b> ( <i>Quercus prinus</i> ).	
<i>Diastrophus bassettii</i> .....	9.	<i>Andricus papillatus</i> .....	23.
		" <i>petiolicola</i> .....	28.
<b>Blackberry</b> ( <i>Rubus villosus</i> ).		<b>White Oak</b> ( <i>Quercus alba</i> ).	
<i>Diastrophus cuscuteformis</i> ..	10.	<i>Andricus seminator</i> .....	21.
" <i>nebulosus</i> .....	11.	" <i>futilis</i> .....	22.
<b>Black Raspberry</b> ( <i>Rubus occidentalis</i> ).		" <i>clavula</i> .....	25.
<i>Diastrophus radicum</i> .....	12.	" <i>petiolicola</i> .....	28.
		" <i>lana</i> .....	29.
<b>Cinquefoil</b> ( <i>Potentilla canadensis</i> ).		<i>Cynips pisum</i> .....	34.
<i>Diastrophus potentillæ</i> .....	13.	<i>Acraspis erinacei</i> .....	35.
		<i>Biorhiza forticornis</i> .....	36.
<b>Scarlet Oak</b> ( <i>Quercus coccinea</i> ).		<i>Holcaspis globulus</i> .....	37.
<i>Amphibolips confluentus</i> .....	14.	<i>Neuroterus batatus</i> .....	41.
" <i>inanis</i> .....	15.	<i>Cecidomyia poculum</i> .....	67.
<i>Andricus punctatus</i> .....	20.		
<i>Cecidomyia pilulæ</i> .....	66.	<b>Pin or Swamp Oak</b> ( <i>Quercus palustris</i> ).	
		<i>Andricus cornigerus</i> .....	19.
<b>Red Oak</b> ( <i>Quercus rubra</i> ).		" <i>palustris</i> .....	26.
<i>Amphibolips confluentus</i> .....	14.	<i>Cecidomyia pilulæ</i> .....	66.
" <i>inanis</i> .....	15.		
" <i>cælebs</i> .....	17.	<b>Black Jack Oak</b> ( <i>Quercus marylandica</i> ).	
" <i>prunus</i> .....	18.	<i>Andricus punctatus</i> .....	20.
<i>Andricus singularis</i> .....	27.	<i>Cecidomyia pilulæ</i> .....	66.
<i>Cecidomyia pilulæ</i> .....	66.		
" <i>niveipila</i> .....	68.		

Species No.		Species No.	
<b>Swamp White Oak</b> ( <i>Quercus</i> <i>platanoides</i> ).		<b>Hickory</b> ( <i>Hickoria</i> sp.).	
<i>Andricus petiolicola</i> .....	28.	<i>Cecidomyia holotricha</i> .....	56.
" <i>capsulus</i> .....	30.	" <i>caryæcola</i> .....	57.
<i>Cynips strobilana</i> .....	33.	" <i>tubicola</i> .....	58.
<i>Holcaspis duricaria</i> .....	38.	" <i>sanguinolenta</i> ....	59.
<i>Neuroterus pallidus</i> .....	40.	" <i>persicoides</i> .....	60.
" <i>noxiosus</i> .....	42.	<i>Phylloxera caryæcaulis</i> .....	86.
" <i>floccosus</i> .....	43.	<b>Dogwood</b> ( <i>Cornus florida</i> ).	
" <i>umbilicatus</i> .....	44.	<i>Cecidomyia clavula</i> .....	64.
<b>Post Oak</b> ( <i>Quercus minor</i> ).		<b>Touch-me-not</b> ( <i>Impatiens bi</i> <i>flora</i> ).	
<i>Andricus petiolicola</i> .....	28.	<i>Cecidomyia impatiens</i> .....	65.
<i>Dryophanta polita</i> .....	39.	<b>Goldenrod</b> ( <i>Solidago</i> sp.).	
<b>Scrub Chestnut Oak</b> ( <i>Quercus</i> <i>prinoides</i> ).		<i>Cecidomyia solidaginis</i> .....	69.
<i>Cynips prinoides</i> .....	32.	<i>Trypeta polita</i> .....	74.
<b>Wild Lettuce</b> ( <i>Lactuca canadensis</i> ).		" <i>solidaginis</i> .....	75.
<i>Aulax tumidus</i> .....	46.	<b>Grape</b> ( <i>Vitis</i> sp.).	
<b>Willow</b> ( <i>Salix</i> sp.).		<i>Cecidomyia viticola</i> .....	70.
<i>Nematus pomum</i> .....	47.	" <i>vitis-pomum</i> ....	71.
<i>Euura ovum</i> .....	48.	<i>Lasioptera vitis</i> .....	72.
<i>Cecidomyia strobiloides</i> ....	61.	<b>Red Maple</b> ( <i>Acer rubrum</i> ).	
" <i>rigidæ</i> .....	62.	<i>Sciara ocellata</i> .....	73.
" <i>batatas</i> .....	63.	<b>Hackberry</b> ( <i>Celtis occidentalis</i> ).	
<b>Alder</b> ( <i>Alnus rugosa</i> ).		<i>Pachypsylla venusta</i> .....	76.
<i>Cecidomyia serrulatæ</i> .....	49.	" <i>celtidis-gemma</i> ...	77.
<b>Basswood</b> ( <i>Tilia americana</i> ).		" " <i>-vesiculum</i>	78.
<i>Cecidomyia verrucicola</i> ....	50.	" " <i>-mamma</i> ..	79.
<b>Tulip-tree</b> ( <i>Liriodendron tulipi</i> <i>fera</i> ).		" " <i>-cucurbitæ</i>	80.
<i>Cecidomyia tulipifera</i> .....	51.	<b>Witch Hazel</b> ( <i>Hamamelis virginiana</i> ).	
" <i>liriodendri</i> .....	52.	<i>Hormaphis hamamelidis</i> ....	81.
<b>Wild Cherry</b> ( <i>Prunus serotina</i> ).		" <i>spinosus</i> .....	82.
<i>Cecidomyia serotinæ</i> .....	53.	<b>Elm</b> ( <i>Ulmus americana</i> ).	
<i>Acarus serotinæ</i> .....	87.	<i>Colopha ulmicola</i> .....	83.
<b>White Ash</b> ( <i>Fraxinus americana</i> ).		<b>Sumac</b> ( <i>Rhus glabra</i> ).	
<i>Cecidomyia peltæ</i> .....	54.	<i>Pemphigus rhois</i> .....	84.
<b>Honey Locust</b> ( <i>Gleditschia tria</i> <i>canthos</i> ).		<b>Huckleberry</b> ( <i>Vaccinium</i> sp.).	
<i>Cecidomyia gleditschiæ</i> .....	55.	<i>Solenozopheria vacciniî</i> ....	45.
		<b>Poplar</b> ( <i>Populus</i> sp.).	
		<i>Pemphigus populicaulis</i> ....	85.

## 6 INSECT-GALLS OF THE VICINITY OF NEW YORK CITY

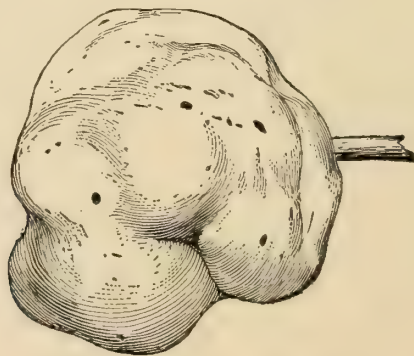
HYMENOPTERA. (Bees, Wasps etc.)

FAMILY CYNIPIDÆ (Gall-flies).

The species belonging to this family are small wasp-like insects termed Gall-flies because the majority of the species live within Galls. In the adult Gall-fly, the abdomen is usually much compressed and is joined to the thorax by a short peduncle. The wings have comparatively few veins, while some species are wingless. The antennæ are not elbowed. They consist of from 13 to 16 joints. The larvæ are maggot-like.

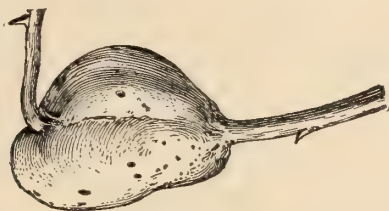


1. **Spiny Rose Gall** (*Rhodites bicolor* Harr.).—Spherical, covered with many long prickly spines. Yellowish green sometimes tinged with red in summer, and brown in winter. Soft in summer, woody in winter. Diameter  $\frac{1}{2}$  in. On twigs of wild roses. Rather common.



2. **Rose Root Gall** (*Rhodites radicum* Osten Sacken).—Irregularly rounded, with a deep impression above and below at place of attachment. Smooth, reddish brown. Pithy in substance, containing numerous cells. Length  $1\frac{1}{2}$  to 2 in. At roots of the wild roses. Not common.





3. **Globular Rose Gall** (*Rhodites globulus* Beuten.).—Smooth, rounded or oblong, rising at each end abruptly from the branch. Rather soft and corky, containing numerous cells. About  $\frac{3}{4}$  to 1 in. long and  $\frac{3}{4}$  in. in diameter. On swamp rose (*Rosa carolina*). Not common.



4. **Long Rose Gall** (*Rhodites dichlocerus* Harr.).—Elongated, hard and woody, gradually tapering at both ends. Color reddish. Length from  $1\frac{1}{2}$  to almost 2 in. Width about  $\frac{1}{2}$  in. On stems of wild roses. Not common.



5. **Knotty Rose Gall** (*Rhodites verna* Osten Sacken).—Oblong or rounded and  $\frac{1}{2}$  in. long. Sometimes there is a series of three or more swellings attached to each other. Reddish, hard and woody, with many cells inside. On stems of wild roses. Not common.



6. **Mossy Rose Gall** (*Rhodites rosæ* Linn.).—Composed of an agglomera-

## 8 INSECT-GALLS OF THE VICINITY OF NEW YORK CITY

tion of hard cells around a branch and is densely covered with long green filaments forming a moss-like mass. About  $1\frac{1}{2}$  in. in diameter. On the twigs of sweet brier (*Rosa rubiginosa*). Common locally.



7. **Mealy Rose Gall** (*Rhodites ignota* Osten Sacken).—Round, woody, about the size of a large pea, and covered with a white mealy substance. Sometimes two or three coalesce, thus forming an elongated mass of more irregular shape. Inside are several cells. On leaves of wild roses. Common.



8. **Rose Lentil Gall** (*Rhodites lenticularis* Bass.).—Lentil shaped. In the parenchyma of the leaves of the wild rose (*Rosa lucida*).  $\frac{1}{10}$  to  $\frac{1}{7}$  in. in horizontal, and  $\frac{1}{8}$  in. in vertical diameter. Not common.



9. **Bassett's Blackberry Gall** (*Diastrophus bassettii* Beuten.).—Irregularly

rounded or somewhat elongated. From about  $\frac{1}{2}$  to 1 in. in diameter. Composed of a pithy substance with many rounded cells inside. Greenish, tinged with red. On the stems of the trailing blackberry (*Rubus canadensis*), close to the ground. Not common.



10. **Blackberry Seed Gall** (*Diastrophus cuscuteiformis* Osten Sacken).—Consists of small globular, woody, seed-like bodies, pressed closely together, each provided more or less with spines. On stems of blackberry. Not common.



11. **Blackberry Knot Gall** (*Diastrophus nebulosus* Osten Sacken).—Oblong, surface somewhat uneven, with deep longitudinal furrows which divide the gall more or less completely into four or five parts. Length from 1 to 3 in. and diameter about 1 to 1½ in. Dark green, turning reddish as the season advances. Hard, corky, with many oblong cells inside. On stalks of blackberry (*Rubus villosus*). Very common.



12. **Raspberry Root Gall** (*Diastrophus radicum* Bass.).—Irregularly rounded. Varying greatly in size and in shape from that of a pea to bodies

## 10 INSECT-GALLS OF THE VICINITY OF NEW YORK CITY

nearly 2 in. in length and 1 in. in diameter. On roots of black raspberry (*Rubus occidentalis*). Common.



13. **Cinquefoil Axil Gall** (*Diastrophus potentillæ* Bass.).—Spherical or oblong, about  $\frac{1}{3}$  to  $\frac{1}{2}$  in. in diameter, containing a single cell. Green in summer; brown and spongy in winter. On axils of leaves of cinquefoil (*Potentilla canadensis*). Common.



14. **Oak or May Apple** (*Amphibolips confluentus* Harr.).—Large, globular, more or less smooth outside and filled with a spongy substance, in the center of which is a hard woody kernel containing the larval cell. From 1 to 2 in. in diameter. When fresh, it is pale green, soft and succulent, with the contents whitish. Later in the season the shell becomes brown, hard and brittle, with the kernel woody and the spongy substance dark brown, but remaining soft. Confined to the leaves of the trees belonging to the red oak group. Common.





15. **Empty Oak Apple** (*Amphibolips inanis* Osten Sacken).—Shape like the preceding, but considerably smaller. Almost empty, the larval cell being kept in position by radiating filaments. Green and soft when young; brown and brittle when dry. On leaves of scarlet (*Quercus coccinea*) and red oak (*Q. rubra*).



16. **Scrub Oak Gall** (*Amphibolips ilicifoliae* Bass.).—Elongated, fusiform, tapering at both ends, with the apex long and more slender than the base. Length about  $1\frac{1}{2}$  in.; width about  $\frac{3}{4}$  inch. Within is an elongated kernel held in position by radiating fibers. Green and soft in summer; brown and brittle in winter. On the leaves and petioles of dwarf oak (*Quercus nana*). Not common.



17. **Oak Spindle Gall** (*Amphibolips cælebs* Osten Sacken).—Elongated, spindle-shape, soft and green. Contains a kernel held in position by radiating fibers. Length  $1\frac{1}{8}$  in. On leaf of red oak (*Quercus rubra*). Not common.

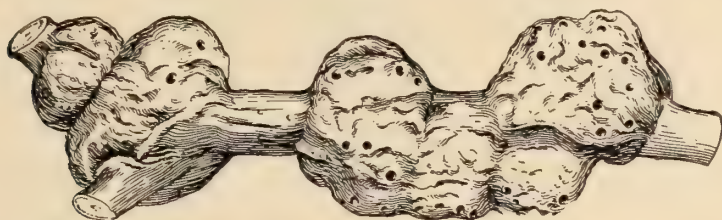


18. **Acorn Plum Gall** (*Amphibolips prunus* Walsh).—Globular, somewhat wrinkled or smooth, fleshy but solid; resembles a plum or cherry. About  $\frac{1}{2}$  to 1 in. in diameter. Bright crimson outside, pinkish inside and shading to yellow towards the center. In the center is a single cell in which the larva lives. On cup of acorn of red oak (*Quercus rubra*). August and September. Sometimes rather common.



19. **Horned Knot Oak Gall** (*Andricus cornigerus* Osten Sacken).—Irregularly globular with many horn-like protuberances through which the gall-flies escape. Very hard and woody. Color of the branch. Inside brown with many larval

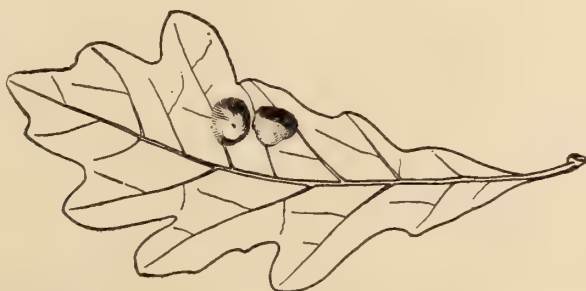
cells. About  $\frac{1}{2}$  to  $1\frac{1}{8}$  in. in diameter. On branches of the pin oak (*Quercus palustris*). Exceedingly common throughout the year.



20. **Oak Knot Gall** (*Andricus punctatus* Bass.).—Shape similar to the preceding gall, but without the horn-like protuberances. Sometimes found singly, but often a number may be seen, in greater or less proximity, on the same branch. On black jack oak (*Quercus marylandica*), scarlet oak (*Quercus coccinea*) and rarely on scrub oak (*Quercus nana*). Common.



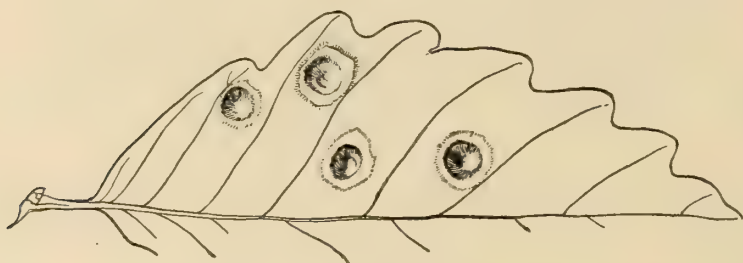
21. **Oak Seed Gall** (*Andricus seminator* Harr.).—Composed of a woolly substance and irregularly rounded. Inside are numerous bodies adhering to the twig and resembling canary seeds. About 1 to  $1\frac{1}{4}$  in. in diameter. Pure white sometimes tinged with red; toward the middle of the summer it assumes a rusty brown color and gradually drops off the twig. On twigs of white oak (*Quercus alba*). Common.



22. **Oak Wart Gall** (*Andricus futilis* Osten Sacken.).—Rounded, somewhat

## 14 INSECT-GALLS OF THE VICINITY OF NEW YORK CITY

flattened, projecting on both sides of the leaf. Inside are two or three seed-like, oblong kernels, kept in position by white filaments. Pale green. In numbers on leaves of white oak (*Quercus alba*). Very common.



23. **Oak Nipple Gall** (*Andricus papillatus* Osten Sacken).—Rounded and somewhat nipple-shaped. Projects on both sides of the leaf and is enclosed in a reddish areola on the under side of the leaf. This is a very characteristic feature and distinguishes it from the preceding species. Inside are two or three kernels each containing a single larva. In numbers on leaves of chestnut oak (*Quercus prinus*). Common.



24. **Scrub Oak Club Gall** (*Andricus similis* Bass.).—Club-shaped, blunt at apex, which is generally turned to one side. Length  $\frac{1}{2}$  to 1 in. Hard and woody, with a few leaves growing from it in summer. On terminal twigs of scrub oak (*Quercus nana*). Not common.





25. **White Oak Club Gall** (*Andricus clavula* Bass.).—Club-shaped, hard and woody, with a few leaves growing from it. Length  $\frac{1}{2}$  to 1 in. Green in summer; brown in winter. On tips of twigs of white oak (*Quercus alba*). Very common.

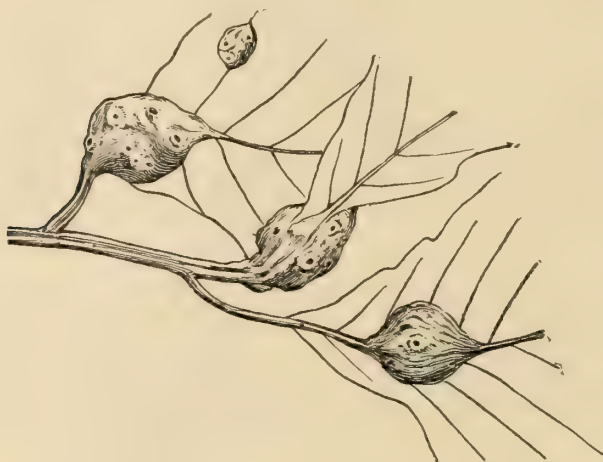


26. **Succulent Oak Gall** (*Andricus palustris* Osten Sacken).—Globular, green, succulent. Hollow inside, with a small seed-like kernel which rolls about freely. Diameter about  $\frac{1}{2}$  in. On buds and young leaves of pin oak (*Quercus palustris*). May.

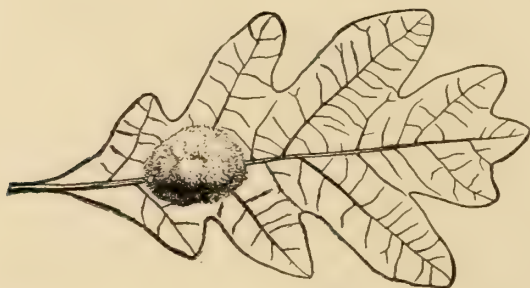


27. **Small Oak Apple** (*Andricus singularis* Bass.).—Globular, smooth,

with an oblong kernel inside held in position by radiating fibers. Green and soft in spring; brown and brittle later in the season. Varies from  $\frac{1}{4}$  to  $\frac{1}{2}$  in. in diameter. On leaves of red oak (*Quercus rubra*). Rather common.



28. **Oak Petiole Gall** (*Andricus petiolicola* Bass.).—Rounded or club-shaped, hard and woody, with many cells inside. About  $\frac{3}{4}$  in. in diameter. Green in summer; brown in winter. On petiole, base or midrib of leaf of white oak (*Quercus alba*), chestnut oak (*Quercus prinus*), swamp white oak (*Quercus platanooides*) and post oak (*Quercus minor*). Common.



29. **Oak Wool Gall** (*Andricus lana* Fitch).—Very much resembles a mass of wool about  $\frac{1}{8}$  in. long. White or buff colored, inside with many small, bright chestnut colored, seed-like capsules, crowded together and attached by their lower ends to the vein of the leaf. On the under side of ribs of leaf of white oak (*Quercus alba*). Common.



30. **Oak Capsule Gall** (*Andricus capsulus* Bass.).—Oval and attached to a pedicel,  $\frac{1}{2}$  to  $\frac{3}{4}$  in. long. Resembles the capsule of certain mosses. On the margin of leaf of swamp white oak (*Quercus platanooides*). Not common.



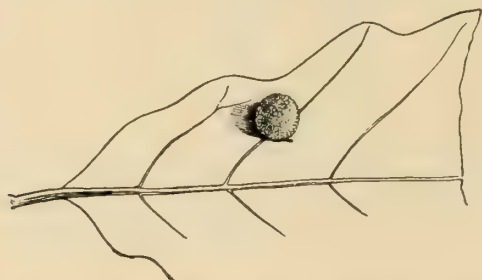
31. **Oak Midrib Gall** (*Andricus piger* Bass.).—A large, irregular woody swelling on the midrib of leaf of black oak (*Quercus velutina*), always on the under side and usually on the lower half of the leaf. Upper side indicated by a widening of the midrib and a slight depression of the leaf at that point. Rather common.



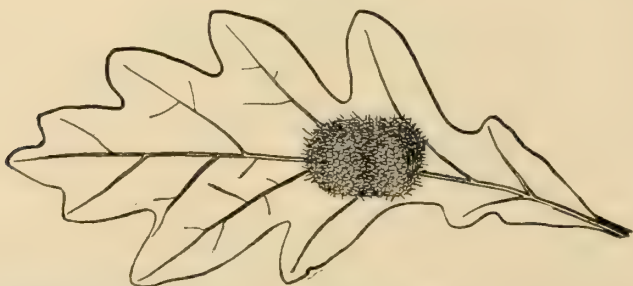
32. **Spiny Oak Gall** (*Cynips prinoides* Beuten.).—Globular, covered with numerous cone-like projections, hard and woody, with a small cell inside. About  $\frac{1}{2}$  in. in diameter. Green, tinged with red. On upper side of leaf of dwarf chestnut oak (*Quercus prinoides*). Not common.



33. **Pine-Cone Oak Gall** (*Cynips strobilana* Osten Sacken).—Consists of many wedge-shaped bodies, closely packed together, with their pointed bases attached to a common center. Hard and corky with a single cell in each. They break off readily when dry. On twigs of swamp white oak (*Quercus platanooides*). Not common.



34. **Oak Pea Gall** (*Cynips pisum* Fitch).—Globular, green and about the size of a pea, which it resembles in general appearance. Surface finely netted with fissures or cracks and intervening elevated points. Inside are two cavities divided in the middle by a thin partition. On upper and under sides of leaves of white oak (*Quercus alba*).



35. **Oak Hedgehog Gall** (*Acraspis erinacei* Walsh).—Rounded or oblong



oval, covered with numerous, rather long spines. Length about  $\frac{3}{4}$  in. Yellow or greenish yellow with the spines bright red, especially when young. On one of the principal veins of leaf of white oak (*Quercus alba*). Common.



36. **Oak Fig Gall** (*Biorhiza forticornis* Walsh).—Consists of many small, soft, bladder-like bodies, each containing a single cell, which is held in position by radiating fibers. They are closely pressed together and somewhat resemble figs packed in boxes,—hence the name “Fig Gall.” Pale yellow, often beautifully tinged with bright red. Brown in winter. On twigs of white oak (*Quercus alba*). Common.



37. **Oak Bullet Gall** (*Holcaspis globulus* Fitch).—Bullet-like, corky, with a small cavity in the center containing a single larva living in an oval, whitish

## 20 INSECT-GALLS OF THE VICINITY OF NEW YORK CITY

shell. Yellow, tinged with red in summer; brown in winter. Grows singly or in clusters of two or three on terminal twigs of white oak (*Quercus alba*). Common.



38. **Pointed Bullet Gall** (*Holcaspis duricaria* Bass.).—Globular, with a short point at the apex. Hard and woody, with a small cavity in the center containing a small oval, whitish shell in which the larva lives. Yellow and tinged with red in summer; brown in winter. On terminal twigs of swamp white oak (*Quercus platanooides*) growing singly or in clusters of two or more. Common.



39 **Polished Oak Gall** (*Dryophanta polita* Bass.) —Globular, smooth, with a thin outer shell. Inside is a single round cell held in position by radiating fibers. Pale green, sometimes tinged with red, and about  $\frac{1}{4}$  to  $\frac{3}{4}$  in. in diameter. On both surfaces of the leaves, at or near the summit of young and thrifty shoots, of post oak (*Quercus minor*). Grows singly or in clusters. August and September. Not rare in the pine barrens of New Jersey.



40. **Oak Flower-Stem Gall** (*Neuroterus pallidus* Bass.).—Small, unevenly globular, smooth and of a fine, soft cellular consistence. Pale wood color. In masses on flower stems of swamp white oak (*Quercus platanooides*). Not common.



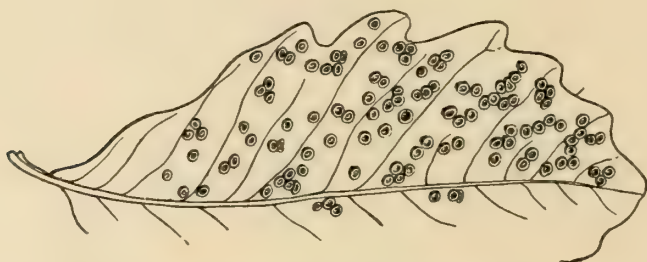
41. **Oak Potato Gall** (*Neuroterus batatus* Fitch.).—Generally large and uneven, often resembling a potato in shape. Hard and woody, the surface being coated with a pale bluish bloom. Inside it is dense, corky, with many larval cells. On white oak (*Quercus alba*) below the terminal shoot. Common.



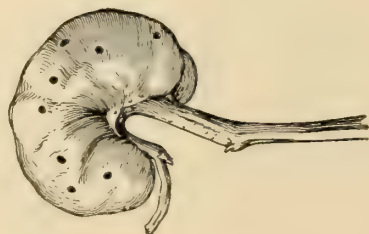
42. **Noxious Oak Gall** (*Neuroterus noxiosus* Bass.).—Irregularly rounded, hard and woody, with many larval cells inside. On the terminal twigs of swamp white oak (*Quercus platanooides*). Common.



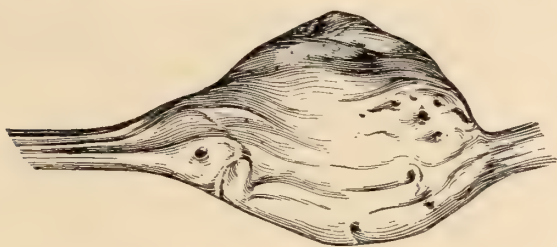
43. **Oak Flake Gall** (*Neuroterus floccosus* Bass.).—Small, hemispherical, covered with white hairs. Found in numbers on the under side of leaf of swamp white oak (*Quercus platanoïdes*). On the upper side of the leaf it is indicated by a small, smooth, shining blister-like elevation. Common.



44. **Oak Button Gall** (*Neuroterus umbilicatus* Bass.).—Small, rounded, much depressed, with a rather deep cavity on top, in the center of which is a minute nipple. About  $\frac{1}{10}$  in. in diameter. Found in numbers on the under side of leaf of swamp white oak (*Quercus platanoïdes*). On the upper side of the leaf it is indicated by a circular spot. Common.



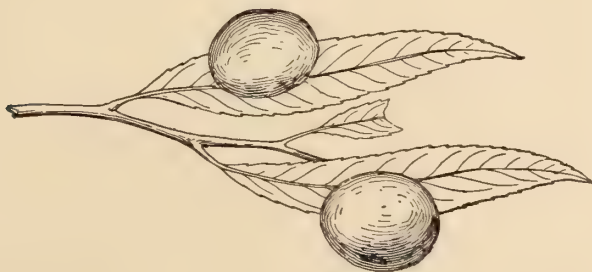
45. **Huckleberry Gall** (*Solenozopheria vaccinii* Ashm.).—Rounded, elongate, concave at place of attachment to the stem, turning the same downward. Green and pithy in summer; brown, hard and woody in winter. On stems of huckleberry. Common.



46. **Lettuce Tumor Gall** (*Aulax tumidus* Bass.).—Varies greatly in shape and size from a slight, knotty and irregular enlargement of the stalk to a large and more or less ovate swelling, 2 to 3 in. long and 1 in. in diameter. Inside it is pithy and filled with many cells. Found on the main stalk of wild lettuce (*Lactuca canadensis*), usually near the summit, often in the panicle itself, and then covered with the short flower stems. Common.

#### FAMILY TENTHREDINIDÆ (Saw-flies).

With few exceptions the members of this family do not produce galls, the larvæ being leaf-eaters. The larvæ very much resemble the caterpillars of butterflies and moths, but they have, ordinarily, from 12-16 prolegs, while true caterpillars have as a rule only 10. The adult female is furnished with a pair of saws at the end of the abdomen which she uses to make slits in the leaves and stems of plants in which she places her eggs.



47. **Willow Apple Gall** (*Nematus pomum* Walsh).—Rounded and fleshy, somewhat resembling a miniature apple. Yellowish green, usually with a rosy cheek. Measures about  $\frac{1}{2}$  in. in diameter. On leaves of bush willow. July and August. Rather common.



## DIPTERA (Flies).

## FAMILY CECIDOMYIIDÆ (Gall-gnats).

The members of this family are minute flies with the wings and body clothed with long hairs. The larvæ are small brightly-colored maggots, being red, pink, yellow or orange.



48. **Willow Egg Gall** (*Euura ovum* Walsh).—Oval or elongated. Placed lengthwise on one side of a twig, often in a row of two or more. Hard and woody. On the stems of bush willow growing in swampy places. Rather common.

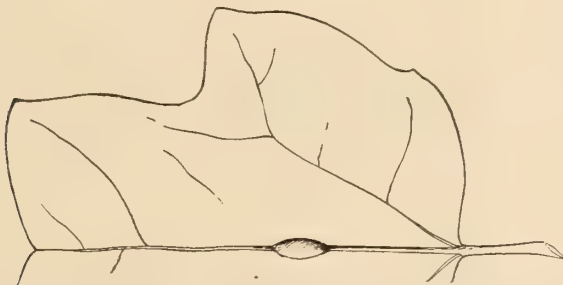


49. **Alder Bud Gall** (*Cecidomyia serrulata* Osten Sacken).—Rounded, bud-like, with the apex pointed, and often covered with a whitish bloom. Greenish in autumn and brown in winter. This gall is a deformation of the terminal bud of the common alder (*Alnus rugosa*). Rather common locally.

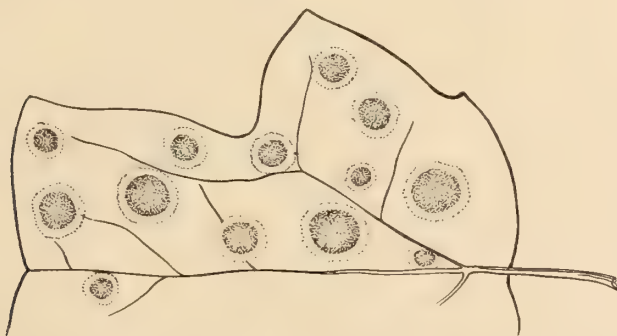


50. **Basswood Wart Gall** (*Cecidomyia verrucicola* Osten Sacken).—Rounded,

wart-shaped, about  $\frac{1}{8}$  in. in diameter. In numbers on the same leaf of basswood (*Tilia americana*). July and August. Rather common.



51. **Tulip-tree Midrib Gall** (*Cecidomyia tulipifera* Osten Sacken).—A small rounded swelling on the midrib of the leaf of the tulip tree (*Liriodendron tulipifera*). Not common.

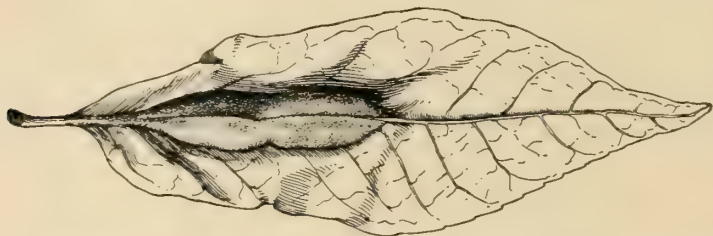


52. **Tulip-tree Spot Gall** (*Cecidomyia liriodendri* Osten Sacken).—Forms brown spots with a yellow or greenish areola on the leaves of the tulip tree (*Liriodendron tulipifera*). Common.



53. **Wild Cherry Bud Gall** (*Cecidomyia serotina* Osten Sacken).—Rounded, club-shaped, with one or two leaves growing from its sides. Bright red in

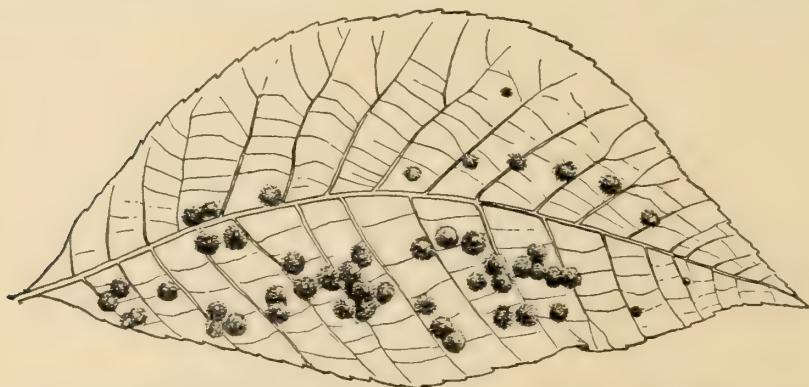
spring; brown in winter. This gall is an enlargement of the terminal bud of young shoots of the wild cherry (*Prunus serotina*). Common.



54. **Ash Midrib Gall** (*Cecidomyia pellex* Osten Sacken).—Rounded, oblong or very much elongated, succulent. Under side indicated by being somewhat swollen. Pale green, sometimes tinged with red. Length from 1 to 2 in. On midrib of leaf of ash (*Fraxinus americana*). May and June. Rather common.

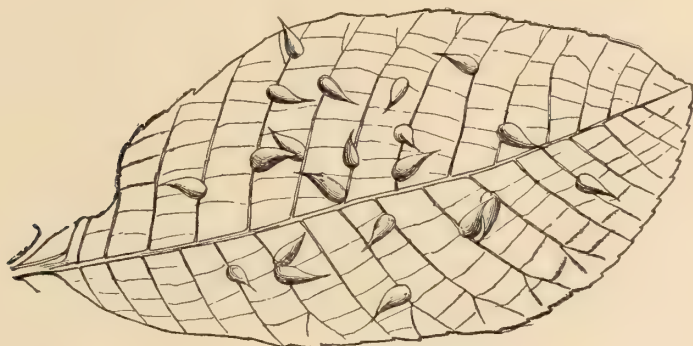


55. **Honey-locust Pod Gall** (*Cecidomyia gleditschiae* Osten Sacken).—Formed of a single leaflet in such a way as to assume the shape of a small pod. On the leaves of honey-locust (*Gleditsia triacanthos*). Sometimes nearly all the leaves on the terminal twigs are deformed in this way. Not common.

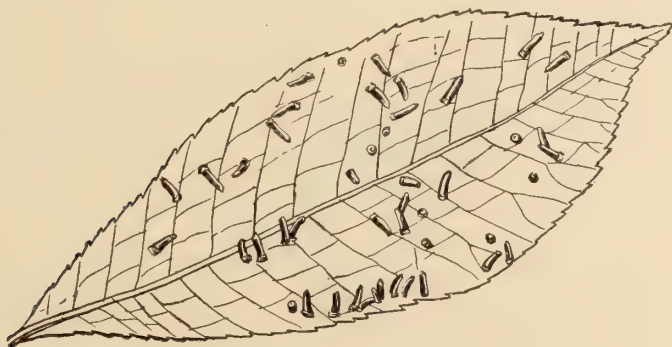


56. **Hickory Onion Gall** (*Cecidomyia holotricha* Osten Sacken).—Sub-

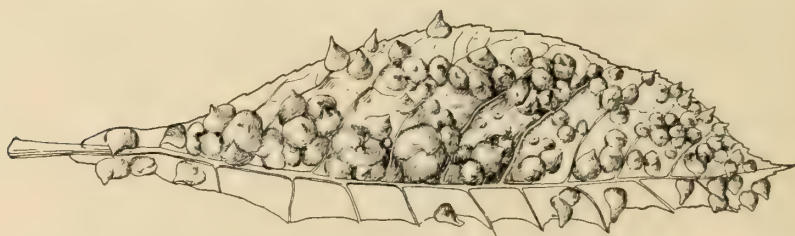
globular, onion-shaped and covered with pubescence which is pale when the gall is young and growing, and becomes rust-colored when mature. Inside it is hollow and contains a single larva. On the under surface of the leaves of different kinds of hickory. Sometimes they cover the entire under surface of the leaf. Very abundant.



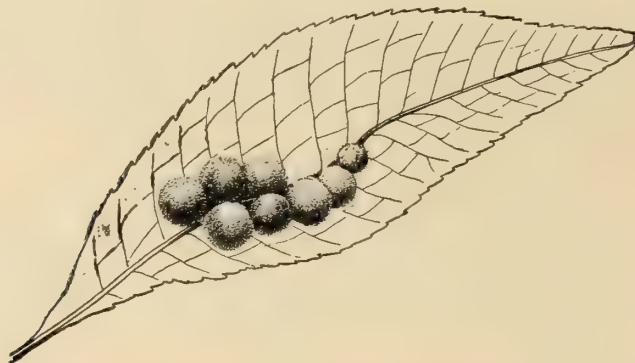
57. **Hickory Seed Gall** (*Cecidomyia caryæcola* Osten Sacken).—Smooth, elongated, rounded, with the tip produced into a point. Pale green. In clusters on the under surface of leaves of different kinds of hickory. Common.



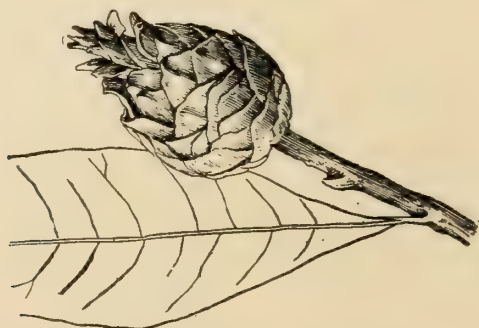
58. **Hickory Tube Gall** (*Cecidomyia tubicola* Osten Sacken).—Narrow, cylindrical, tube-like, inserted in a small protuberance on the leaf, breaking off very easily. Green when immature; black when fully grown. On under surface of the leaves of different kinds of hickory. Common.



59. **Hickory Cone Gall** (*Cecidomyia sanguinolenta* Osten Sacken).—Conical, somewhat narrowed at the base and of a blood red or purplish red color. In numbers on the under surface of the leaves of hickory. Not common.



60. **Hickory Peach Gall** (*Cecidomyia persicoides* Osten Sacken).—Variable in shape, usually rounded and clothed with delicate down like that of a peach, looking somewhat like a diminutive fruit of this kind. On the under surface of the leaves of hickory. Common.



61. **Pine-Cone Willow Gall** (*Cecidomyia strobiloides* Osten Sacken).—Formed of closely imbricated leaves assuming the shape of a cone. On the terminal twigs of different kinds of low willow. Common.





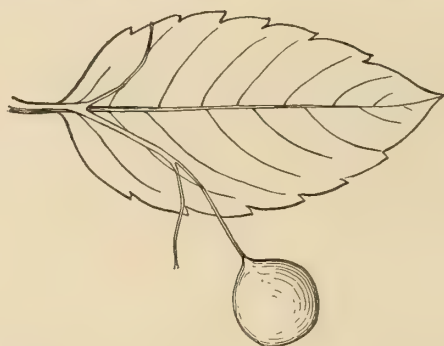
62. **Willow Club Gall** (*Cecidomyia rigida* Osten Sacken).—Elongated, club-like, tapering to a point at the apex, and with a number of small terminal buds growing from it. Length about  $\frac{3}{4}$  in. On tips of branches of low willow. Rather common.



63. **Willow Potato Gall** (*Cecidomyia batatas* Osten Sacken).—Irregularly rounded, varying considerably in size and in shape. Hard and woody. Sometimes the different forms are strung together, one after another, in more or less proximity, on the same twig. On branches of willow (*Salix discolor*). Common.



64. **Dogwood Club Gall** (*Cecidomyia clavula* Beuten.).—Club-shaped and about  $\frac{1}{2}$  to 1 in. long. Inside is an elongated channel inhabited by a single larva. Green in summer and the color of the bark in winter. On terminal twigs of dogwood (*Cornus florida*). Common.



65. **Touch-me-not Gall** (*Cecidomyia impatiens* Osten Sacken).—Globular, succulent, semi-transparent, containing a number of cells inside. At base of flower of touch-me-not (*Impatiens biflora*). August. Not common.



66. **Oak Pill Gall** (*Cecidomyia pilulæ* Walsh).—Usually rounded, hard and woody. Frequently two or more galls are confluent and assume a very irregularly rounded or elongated form. Inside are several cells. Brown or green. On upper surface of leaves of different kinds of oak. Very common.



67. **Oak Spangles** (*Cecidomyia poculum* Osten Sacken).—Rounded, saucer-

shaped. Pale red to light lavender. In clusters on under surface of leaf of white oak (*Quercus alba*). August and September. Common.



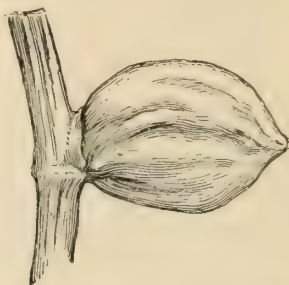
68. **Oak Fold Gall** (*Cecidomyia niveipila* Osten Sacken).—Consists of a large fold lined with white pubescence. Sometimes the entire leaf is folded with the edges curled, the under side of the leaf being inside of the gall. On red oak (*Quercus rubra*). May and June. Common.



69. **Goldenrod Bunch Gall** (*Cecidomyia solidaginis* Loew).—Produced by the arrest of the stalk, which causes the leaves to accumulate, thus forming a globular bunch, consisting of several hundred leaves. On goldenrod (*Solidago*). Very common.



70. **Grape-vine Tube Gall** (*Cecidomyia viticola* Osten Sacken).—Narrow, elongated or conical. Green or bright red. In numbers on upper side of the leaves of wild grapes. July and August. Not common.



71. **Grape-vine Apple Gall** (*Cecidomyia vitis-pomum* Walsh and Riley).—Variable in size and in shape, usually rounded, flattened at the base and pointed at the top. When mature the gall often has eight or nine longitudinal ribs, like a muskmelon. Inside are numerous longitudinal cells each divided by a transverse partition. On stems of wild grapes. Common.



72. **Grape-vine Tomato Gall** (*Lasioptera vitis* Osten Sacken).—Consists of a bunch of irregular swellings of various rounded shapes. Soft, juicy and suc-

culent. Yellowish green, tinged with red or entirely of this color. On stems and leaf stalks of wild grapes. May and June. Common.

#### FAMILY MYCETOPHILIDÆ (Fungus-gnats).

The species of flies belonging to this family are of medium or small size and are more or less mosquito-like in form. Most of them feed on fungi and in damp places where there is decaying vegetable matter.



73. **Maple Spot Gall** (*Sciara ocellata* Osten Sacken).—Eye-like, circular, flat. Light yellow, with a red central dot, or entirely green or yellow. In numbers on the leaves of red maple (*Acer rubrum*). Common.

#### FAMILY TRYPETIDÆ.

Only a certain number of species belonging to this family of flies produce galls. The wings of many of the species are beautifully marked with spots or bands.

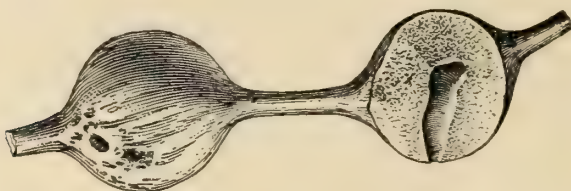


74. **Goldenrod Gall** (*Trypeta polita* Loew) —Consists of a small bunch of



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accumulated aborted leaves,  $\frac{1}{2}$  to  $\frac{3}{4}$  in. long. Caused by the arrest of the side branches. Inside, at the base, is a hollow space in which the larva lives. On stalk of goldenrod (*Solidago altissima*). Singly or in numbers. Common.



75. **Goldenrod Ball Gall** (*Trypeta solidaginis* Fitch).—Globular, ball-like and about 1 in. in diameter. Pithy inside with a rounded cell in the center. On the main stalk of goldenrod. Common.

## HEMIPTERA (Bugs).

### FAMILY PSYLLIDÆ (Jumping Plant-lice).

The insects belonging to this family subsist entirely upon the juices of plants. They are comparatively small, measuring from  $\frac{1}{8}$  to  $\frac{1}{16}$  inch in length. Their hind legs are formed for jumping.



76. **Hackberry Petiole Gall** (*Pachypsylla venusta* Osten Sacken).—Globular or irregularly rounded. Consists of a thin outer shell with several compartments inside. On petiole of the leaf of hackberry (*Celtis occidentalis*). Not common.



77. **Hackberry Nodule Gall** (*Pachypsylla celtidis-gemma* Riley).—Variable in size and in shape. Bud-like and looking as if formed by the agglomeration of a number of rounded nodules. Hard and woody, with a number of cells inside. On branches of hackberry (*Celtis occidentalis*). It is a deformation of the young bud. Common.



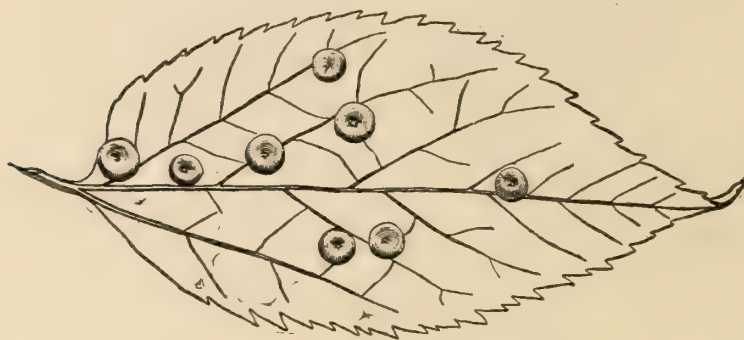
78. **Hackberry Blister Gall** (*Pachypsylla celtidis-vesiculum* Riley).—Circular, flat and blister-like. Convex on the under side with a small nipple in the middle. Green. In numbers on leaf of hackberry (*Celtis occidentalis*). Common.



79. **Hackberry Nipple Gall** (*Pachypsylla celtidis-mamma* Riley).—Repre-

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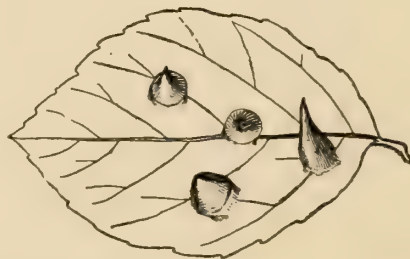
sented by a cup-shaped impression on the upper side of leaf and on the under side it is sub-cylindrical, with the apex rounded bluntly. About  $\frac{1}{4}$  in. high and  $\frac{1}{8}$  in. wide. On leaf of hackberry (*Celtis occidentalis*). Common.



80. **Hackberry Melon Gall** (*Pachypsylla celtidis-cucurbitæ* Riley).—Under side rounded, truncated at apex and concave in the middle, with a small nipple. Around the top is usually an acute ridge which surrounds the concave depression, and at the sides near the top are short ribs which are sometimes nearly obliterated. Represented by a cup-shaped impression on upper side of leaf. On under side of leaf of hackberry (*Celtis occidentalis*). Common.\*

### FAMILY APHIDIDÆ (Plant-lice).

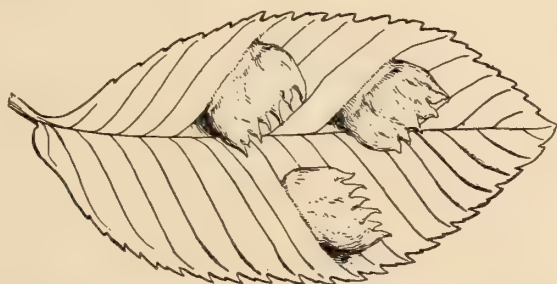
The plant-lice are well-known insects and infest nearly all kinds of plants. Comparatively few produce galls.



81. **Witch Hazel Cone Gall** (*Hormaphis hamamelidis* Fitch).—A conical swelling on upper side of leaf of witch hazel (*Hamamelis virginiana*). Very common.



82. **Spiny Witch Hazel Gall** (*Hormaphis spinosus* Shiner).—A deformation of the fruit bud, covered with a number of rather long spines, with a funnel-like exit at the base. Green in summer; brown in winter. On witch hazel (*Hamamelis virginiana*). Common.



83. **Cock's Comb Elm Gall** (*Colopha ulmicola* Fitch).—Forms a cock's comb, blubber-like growth on the upper side of the leaf of the elm (*Ulmus americana*). June. Common.



84. **Sumac Tomato Gall** (*Pemphigus rhois* Fitch).—Smooth, rounded.

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somewhat resembling a tomato in shape. Inside it is hollow and filled with lice. Yellowish green, tinged with red. On under side of leaf of smooth sumac (*Rhus glabra*) and stag-horn sumac (*Rhus typhina*). Common.



85. **Poplar Stem Gall** (*Pemphigus populicaulis* Fitch).—Irregularly globular, with a mouth-like orifice at the base on one side. On poplar at the junction of the stem and the leaf. Common.



86. **Hickory Louse Gall** (*Phylloxera caryocaulis* Fitch).—Globular or hickory-nut shape. Hollow inside and filled with lice. When fully grown it bursts open and becomes cup-shaped. Green and leathery. On twigs and leaf-stalks of hickory. May and June. Very common.

#### ACARINA. (Mites.)

##### FAMILY ACARIDÆ.

The members of this order are minute insects closely allied to the spiders. They are parasitic upon animals, man and plants; a certain number produce galls.



87. **Wild Cherry Pouch Gall** (*Acarus serotinae* Beuten.).—Stem-like, expanding at the end into a pouch-like sack. About  $\frac{2}{3}$  in. long. Hollow, with an exit on under side of leaf. Green or red. In numbers on leaf of wild cherry (*Prunus serotina*). Common.







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AMERICAN MUSEUM OF NATURAL HISTORY

The Fossil Carnivores  
Marsupials and Small Mammals  
in the  
American Museum of Natural History



BY

W. D. Matthew, Ph.D.

Associate Curator of Vertebrate Palæontology

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL  
VOL. V, No. 1, JANUARY, 1905

Guide Leaflet No. 17



# American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

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FIG. 1. RESTORATION OF MESONYX, A GIGANTIC CREODONT. UPPER EOCENE OF UTAH. BY CHARLES R. KNIGHT. AFTER OSBORN

# The Fossil Carnivores Marsupials and Small Mammals in the American Museum of Natural History.

A Guide Leaflet to the Collections  
in the  
Department of Vertebrate Palæontology.

By

W. D. MATTHEW, Ph.D.,

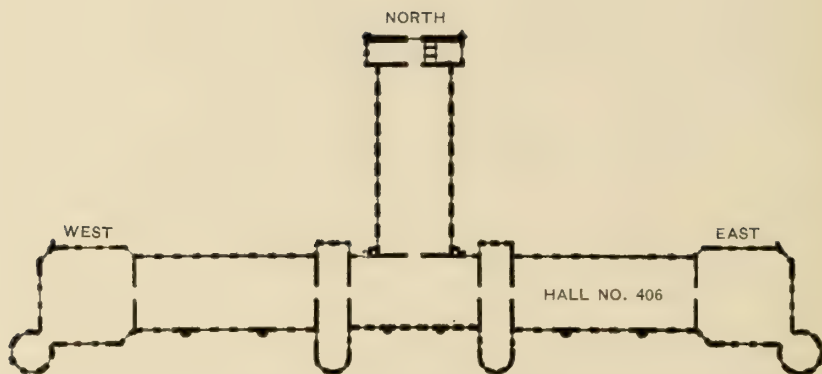
ASSOCIATE CURATOR OF VERTEBRATE PALÆONTOLOGY.

**GUIDE LEAFLET No. 17.**

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New York. Published by the Museum.



#### FOURTH FLOOR.

The Collections of Carnivores, Marsupials and Small Mammals upon which this Guide Leaflet is based are exhibited in the northwest quarter of Hall No. 406 of the East Wing, fourth floor of the Museum.

#### PREFATORY NOTE.

THE collections in the Hall of Fossil Mammals were gathered together under direction of Professor Henry Fairfield Osborn, Curator of the Department, Vice-President and Trustee of the Museum. They are chiefly the result of expeditions to the various Rocky Mountain States, where the richest localities for such specimens are found. These explorations, the funds for which are provided by the generosity of the Trustees of the Museum, have been systematically carried on since 1891. The Cope Collection of Fossil Mammals, purchased in 1894, and various exchange collections from foreign museums, are also exhibited in this hall.

Besides the general guide to the Collection of Fossil Vertebrates, re-issued in October, 1903, a series of special guides, each covering one or more important zoological groups, is in course of preparation. These treat of the evolution of each race of animals, and the various problems and theories that are illustrated by the specimens in the hall, more fully than could be done in the general guide.

The present number treats of the Fossil Carnivores, or Flesh-eating Mammals, the Marsupials, or Pouched Mammals, the Rodents, Insectivores, Bats and others, which may be grouped together as Small Mammals. This is the second special guide: the first, treating of the Evolution of the Horse, was published in 1902. Others shortly to appear are on the Titanotheres, the Elephants and the Dinosaurs.

EDITOR.



# FOSSIL CARNIVORES, MARSUPIALS AND SMALL MAMMALS

IN THE

AMERICAN MUSEUM OF NATURAL HISTORY.<sup>1</sup>

BY W. D. MATTHEW, PH.D.

Associate Curator of Vertebrate Palæontology.

## I. CARNIVORA.

THE Carnivora live principally on the flesh of other animals and have teeth and claws adapted to such food. Most of them, however, eke out their proper food, in times of scarcity, or for mere variety, with berries, nuts, bulbs and roots or even with grass, and some, at certain seasons, find little else available. Carnivores have large canine teeth adapted for cutting or for cutting and chewing, but never for grinding. All of them have claws, and they use their feet in a more varied way than do the Herbivora, for seizing and striking as well as for running and jumping. They walk either upon the entire sole of the foot (bears) or upon the under surface of the toes (dogs, cats etc.), never upon the tips of the toes as do the hoofed animals.

There are three divisions:

A, CREODONTA, OR PRIMITIVE CARNIVORA. Extinct land Carnivora with various primitive characters. None now extant.

B, FISSIPEDIA, OR TRUE CARNIVORA. Toes separate; terrestrial or amphibious; preying on land animals. Modern beasts of prey.

C, PINNIPEDIA, OR MARINE CARNIVORA. Web-footed, marine, fish-eating. Seals and Walruses.

Fossil land Carnivora are more numerous and varied than modern kinds. More than 250 fossil species have been described from the United States alone, while but 94 living species are recognized in this country. The majority of the fossil species

<sup>1</sup> This article forms No. 17 of the Museum series of **GUIDE LEAFLETS** and may be obtained in separate form.

fall into one or another of the living families and are more or less directly ancestral to the modern beasts of prey. The remainder belong to several extinct branches, not ancestral to any of the modern families, and are combined in the rather heterogeneous group of Creodonta. Seals and Walruses have not been found fossil, except in the most recent deposits, and nothing is known of their evolution.

#### A. CREODONTA, OR PRIMITIVE CARNIVORA.

In all modern Carnivora one tooth in the upper and one in the lower jaw are enlarged and especially adapted to the cutting of flesh. Each consists mainly of a high strong crest, or ridge,



FIG. 2. UPPER AND LOWER TEETH OF THE WOLF

Shows the carnassials or flesh-cutting teeth (the fourth premolar in the upper jaw, the first true molar in the lower)

and the two crests, or "blades," work against each other like the blades of a pair of scissors. These teeth are called the "carnassials," or flesh-teeth. In all the modern Carnivora the fourth (last) upper premolar and the first lower true molar are the carnassial teeth. The fossil species show the gradual evolution of this specialized tooth in the various families of Carnivores. In the Creodonta, on the other hand, there is either no carnassial tooth, or it is developed from other teeth of the series, in one group the first upper and second lower true molars, in another the second upper and third lower molars. (Compare Figures 2, 3, 4 and 5.)

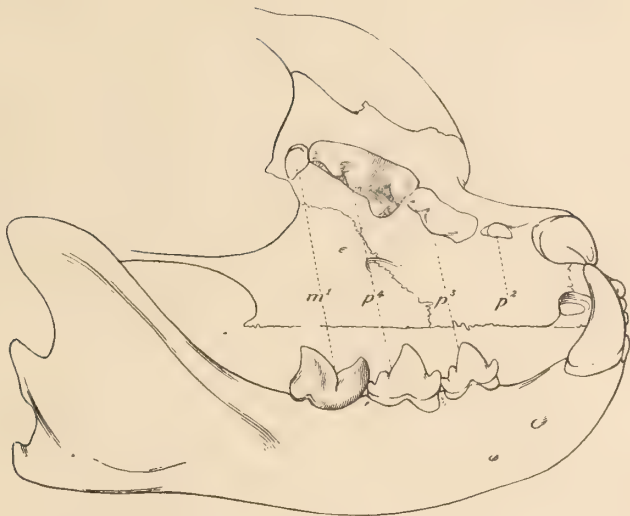


FIG. 3. UPPER AND LOWER TEETH OF THE LION  
Shows the carnassials corresponding to those in the Wolf

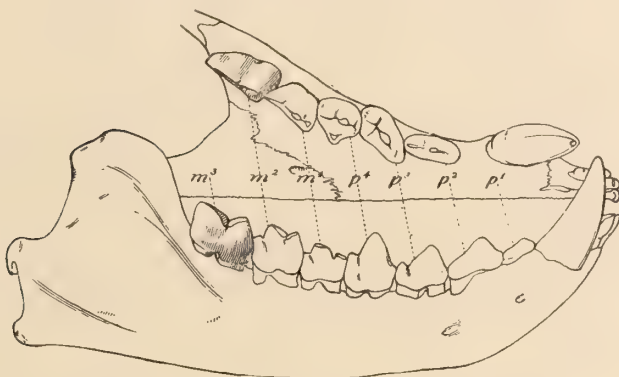


FIG. 4. UPPER AND LOWER TEETH OF HYÆNODON  
Shows the carnassial teeth (second upper and third lower molar)

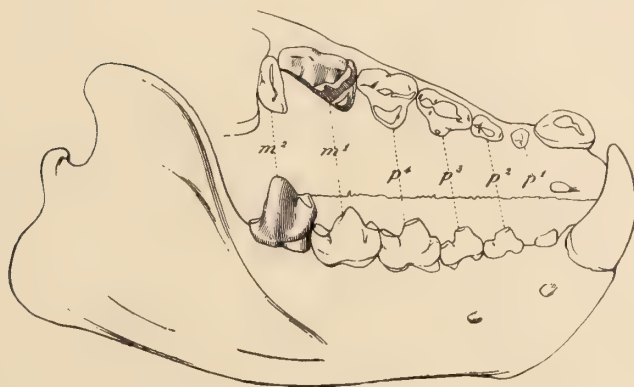


FIG 5. UPPER AND LOWER TEETH OF OXYÆNA  
Shows the carnassial teeth (first upper and second lower molar)

Another characteristic of all modern Carnivora is the union of two bones of the wrist, the scaphoid and lunar, which are distinct in most other animals. This gives additional strength to the thumb side of the very flexible wrist. In the Creodonts, these two bones were separate, and it is probable that they were separate in the earliest ancestors of the true Carnivores. Many

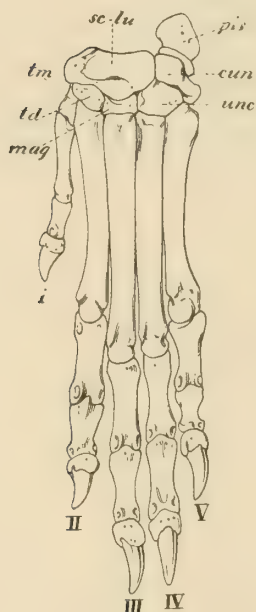


FIG. 6. FORE-FOOT OF THE WOLF  
Shows the compact, slender foot, and the scaphoid and lunar bones of the wrist united (*sc-lu*) as in all true Carnivora

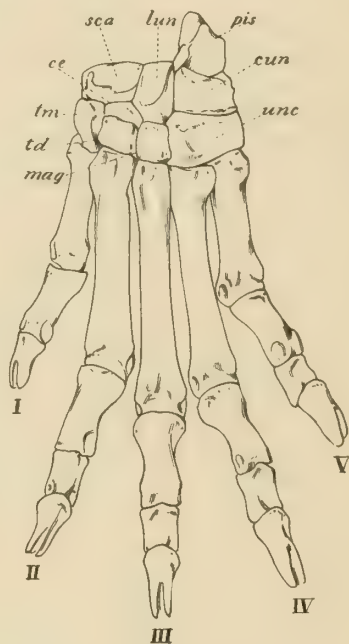
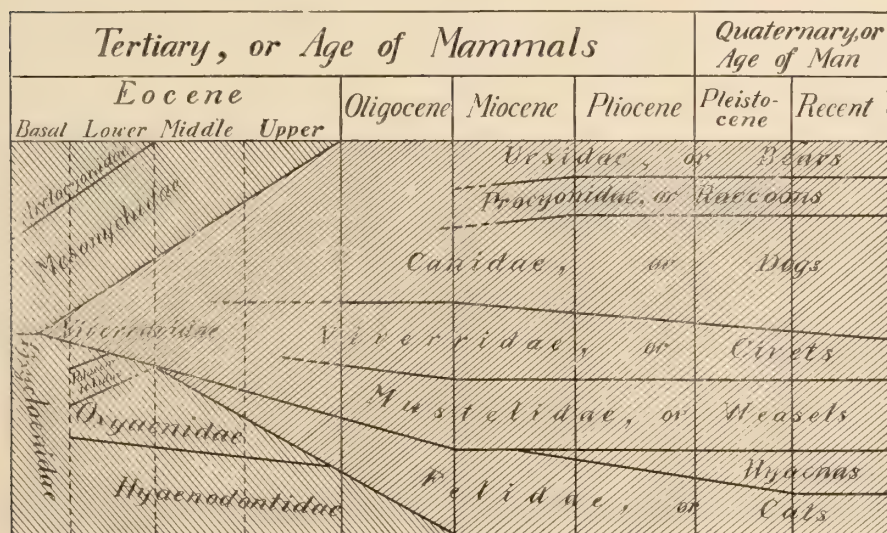


FIG. 7. FORE-FOOT OF HYÆNODON  
Shows the shorter and less compact foot, and the separate scaphoid, centrale and lunar bones in the wrist (*sca, ce, lun*) as in all Creodonts

Creodonts also preserve a small extra bone, the "centrale," which is found now only in monkeys and in certain Insectivora and other small mammals. This bone seems to have been generally present in the ancient mammals.

The most ancient Creodonts are of especial interest to students, because they are thought to represent more nearly than any other fossils known, the central stock from which most modern mammals have descended. They appear already numerous

and varied, at the dawn of the Age of Mammals, and the different kinds become more and more specialized throughout the Eocene epoch. Meanwhile the true Carnivores appear in increasing numbers and gradually crowd out the Creodonts until the last of them has disappeared by the end of the Oligocene epoch. In their evolution the different Creodont groups specialized on much the same lines of development as those the true Carnivores took



*Diagram showing how the true Carnivora crowded out the Creodonta or Primitive Carnivora during the Tertiary Period.*



*Creodonta.*



*True Carnivora.*

FIG. 8

afterwards. They were more or less wolf-like, weasel-like, cat-like or bear-like, according to the nature of their food and the manner of attacking their prey.

Fossil remains of flesh-eating animals are by no means as common as those of Herbivora, and the remains of Creodonts are especially rare, and mostly fragmentary. The great majority have been found in the Eocene fossil fields of the Western United States. This Museum is peculiarly rich in these rare and interesting fossils. Out of the 113 American species it possesses all the known specimens of 50 and the types or other good



specimens of 48 others (including three complete mounted skeletons), while only 15 species are not represented.



FIG. 9. UPPER AND LOWER TEETH OF TRICENTES

Represents the most primitive type of teeth of the Carnivora, with no specialized carnassials. Natural size

### OXYCLÆNIDÆ.

Types: *Chriacus*, *Tricentes*, *Deltatherium*. Upper and lower jaws.

Small primitive animals with unspecialized teeth resembling those of lemurs. Only fragmentary specimens have been found, and but little is known about them. They are the most ancient group of the Creodonts and appear to have been nearest to the central stock from which the other Creodonts and Carnivores are descended. They are found only in the Basal Eocene.

### ARCTOCYONIDÆ.

Types: *Arctocyon*, skull (cast); *Clanodon*, jaws and feet; *Anacodon*, jaws.

Bear-like omnivorous Creodonts with sharp canine teeth and the crowns of the molars flattened and wrinkled on the surface. The animal walked on the entire sole of the foot, and had large sharp claws like the modern bears. As in all these ancient mammals the brain was very small, as can be seen in the skull of *Arctocyon*.

### PALÆONICTIDÆ.

*Palæonictis*, front of skull and jaws.

This rare and primitive group of Creodonts is thought by some authors to be the remote ancestor of the Cat family. It is found only in the Lower Eocene.



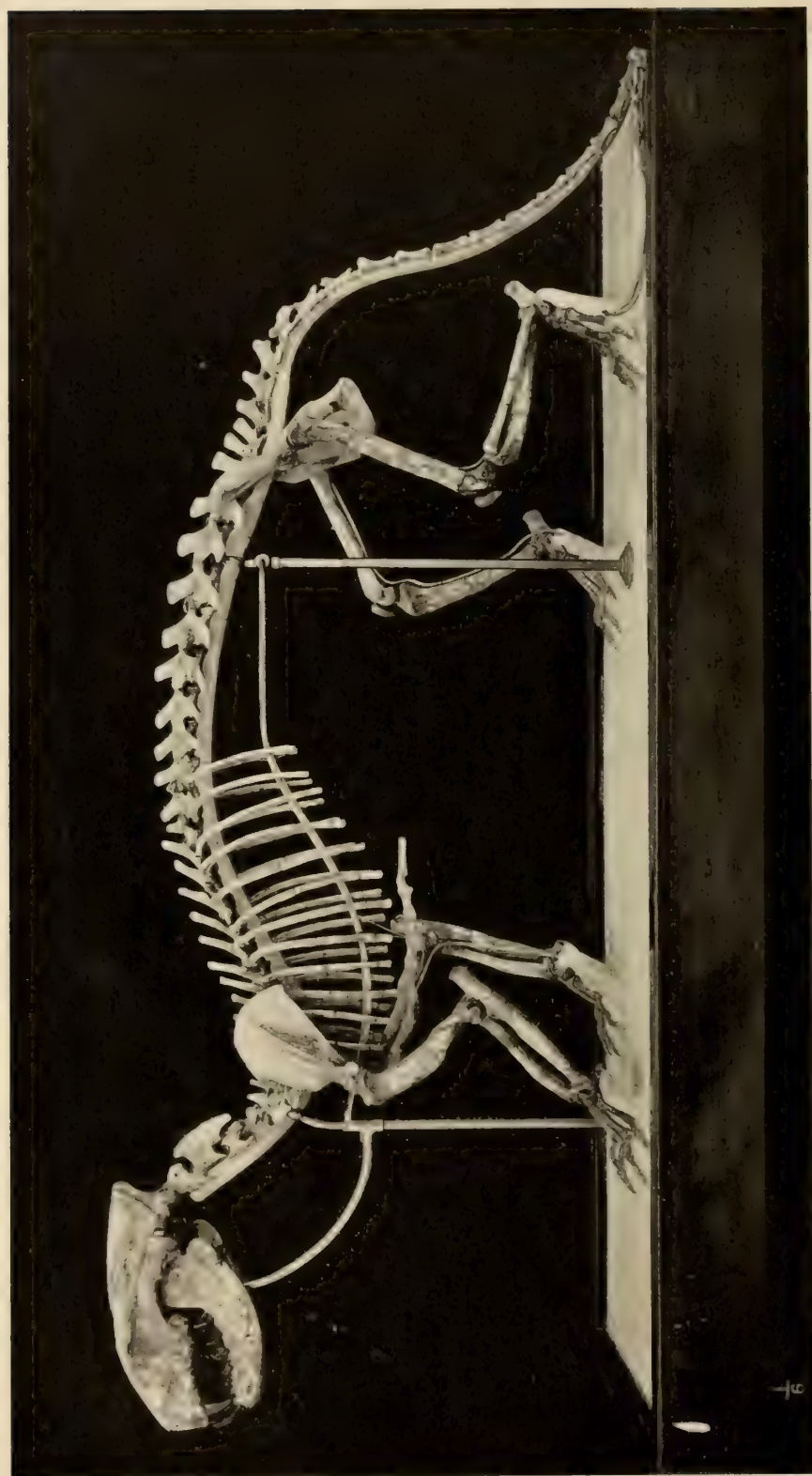


FIG. 10. MOUNTED SKELETON OF *OXYÆNA LUPINA*, AN ANCIENT TYPE OF CREODONT FROM THE LOWER EOCENE OF WYOMING  
(One-sixth natural size. After Wortman)

## OXYÆNIDÆ.

Types: *Oxyæna* and *Patriofelis*, skeletons.

Somewhat resembling the larger Mustelines, such as the Otter and the Wolverine, with short heavy jaws adapted to seize and hold their prey, with long body and with short powerful limbs adapted for leaping, climbing or swimming, but not for swift running. The tail was extraordinarily long, and was larger than in any of the modern Carnivora. The teeth were adapted for flesh-eating, the first upper and second lower molar being enlarged and specialized for cutting the flesh. (See Fig. 5.)

*Oxyæna*, from the Lower Eocene, was about as large as a Wolverine. The head is disproportionately large, and the tail as long as the entire body and head. The brain-case is very small, and the space for jaw-muscles very large, the whole organization much inferior to that of modern flesh-eaters. Powerful and savage it no doubt was, but far from having the keen intelligence, speed and endurance of the Carnivora of to-day.

The mounted skeleton of this rare animal is due to a fortunate accident. In the Cope Collection there was an incomplete and fragmentary skeleton collected in 1881 in Northern Wyoming by Dr. J. L. Wortman. In 1891 Dr. Wortman, while collecting for this Museum in the same region, discovered another fragmentary skeleton, also incomplete. After the purchase of the Cope Collection by the Museum, these two specimens were compared and found to be parts of the same individual, together constituting a nearly complete skeleton, which has been mounted and placed on exhibition, with the missing parts restored in tinted plaster.

In *Oxyæna* the last upper molar has disappeared, and the second possesses a large shearing blade placed transversely to that of the first molar. In *Patriofelis* of the Middle Eocene the second molar has become very small, and all the flesh-cutting is done by the first molar, shearing against the second lower molar. The teeth are therefore a stage farther advanced in specialization.

The *Patriofelis* skeleton is composed of two individuals of the same species which were found at the same horizon and locality. The animal was about as large as a jaguar, and massively pro-

portioned, with short heavy limbs and broad blunt-clawed feet. It has been thought that *Patriofelis* was of aquatic habits, and more or less nearly ancestral to the Seals; but it was more probably terrestrial, as its teeth indicate adaptation to flesh food, not to fish eating. The limbs and face most nearly resemble those of the short-legged Mustelines, otter, mink etc., among modern animals, and some of these are aquatic or semi-aquatic; but this resemblance may be merely because in both animals the limbs are short and heavy.

#### HYÆNODONTIDÆ.

Types: *Sinopa*, skull and other parts; *Hyænodon*, skeleton and skulls.

Two groups of animals are included in this family, one represented by *Sinopa*, small long-bodied weasel-like animals with teeth little specialized, suggesting those of the Opossum, the other by *Hyænodon*, which was larger, proportioned more like the Tasmanian Wolf, with teeth highly specialized for flesh-cutting. The first group was probably arboreal, the second terrestrial in habit.

In *Sinopa*, which was characteristic of the Eocene, the crowns of the molars are triangular and each has a longitudinal shearing edge in front and one transverse. In *Hyænodon* of the Oligocene the transverse shear has disappeared completely, the longitudinal shear is concentrated especially on the third lower and second upper molar, the third upper molar has disappeared, and the teeth are as highly specialized for flesh-cutting as those of the living Cats. (See Fig. 3.)

*Hyænodon* lived during the Oligocene epoch and was the last survivor of the Creodonts. In proportions it singularly resembles the Thylacine, or Tasmanian Wolf, of the rough bush-land of Tasmania. The head is of very large size, with long jaws and large teeth, adapted to snapping rather than seizing and holding on to the prey. The feet had large, rather blunt claws, not retractile, and the animal appears to have walked on the toes, like the dogs and cats, not resting the sole on the ground as do the bears. (See Fig. 6.) A finely preserved skeleton and several skulls from the Big Badlands of South Dakota are mounted in the collection. The largest skull is nearly a foot long.



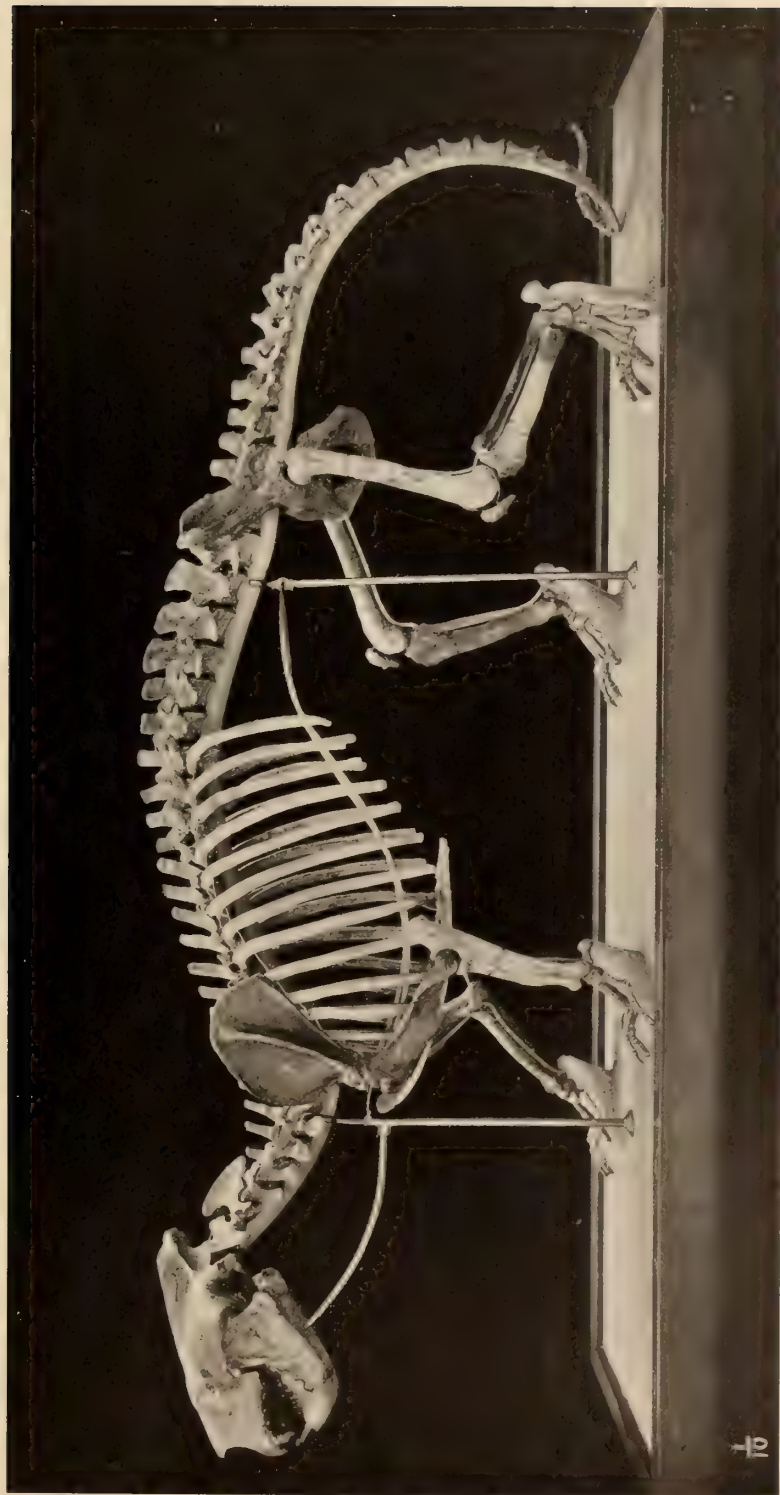


FIG. 11. MOUNTED SKELETON OF PATRIOFELIS FEROX, A CREODONT FROM THE MIDDLE EOCENE OF WYOMING  
One-tenth natural size. After Osborn



## MESONYCHIDÆ.

Type: *Mesonyx*, skull etc, Wall-case No. 6.

These animals had the limbs and feet specialized for swift running, and the feet tipped with flat hoof-like claws. The teeth are quite peculiar, they have no shearing edges, and the crown is composed of three rather high blunt-topped conical cusps. In

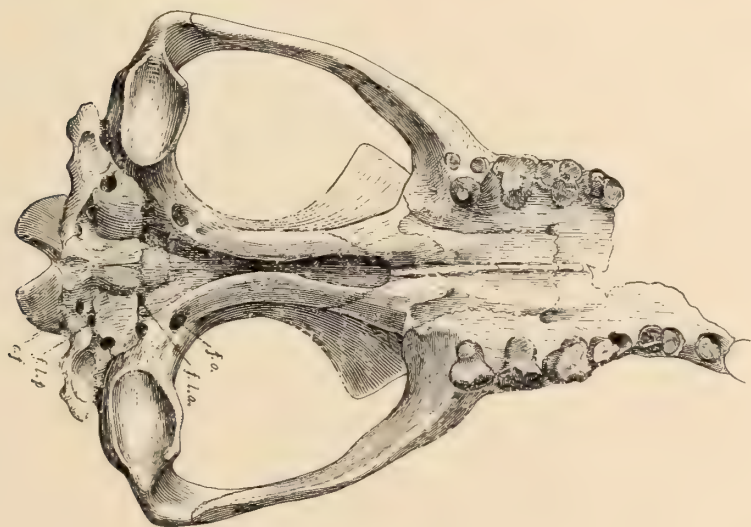


FIG. 12. SKULL OF MESONYX

Upper Eocene of Utah. After Osborn

the upper jaw these are in a triangle, one cusp inside, two outside; in the lower jaw they are in series, the central one being much the highest.

The Mesonychidæ are found in all the Eocene strata from the oldest to the youngest, and show a series illustrating the gradual evolution of their peculiar type of tooth. The massive blunt-cusped teeth, generally very much worn, suggest that they were used for crushing bones or other hard food, and that the animal fed upon carrion, like the modern hyæna. (See Fig. 1.)

## B. FISSIPEDIA, OR TRUE CARNIVORA.

There are seven <sup>1</sup> families of living Carnivora, four of which are cosmopolitan, being found in all the continents except Australia, while one (the Raccoons) is peculiar to America, and two (the Civets and the Hyænas) are peculiar to the Old World. The families are:

1. URSIDÆ, or Bears (Black Bear, Grizzly, Polar Bear etc.).
2. PROCYONIDÆ, or Raccoons (Raccoon and some rarer animals).
3. CANIDÆ, or Dogs (Wolves, Foxes, Jackals).
4. VIVERRIDÆ, or Civets (Civet, Mongoose etc.).
5. MUSTELIDÆ, or Mustelines (Weasel, Otter, Badger, Skunk etc.).
6. FELIDÆ, or Cats (Lion, Tiger, Leopard, Puma, Lynx etc.).
7. HYÆNIDÆ, or Hyænas.

The predaceous animals of Australia and the islands near to it are all Marsupials, or Pouched Mammals, except a wild Dog which was probably introduced by man. The range of the families of true Carnivora in former geological epochs was the same as now, except that South America had no true Carnivores until the Pliocene epoch, their place being taken by carnivorous Marsupials related to those which still inhabit Australia. In general the fossil true Carnivores are placed without difficulty in one or another of the families still surviving; but the earliest known ancestors of all these families were so much alike that it is hardly possible to say in which family they should be placed, and they are conveniently grouped together under the name of VIVERRAVIDÆ, or Ancient Civets, as the Civets among all the modern Carnivores are least altered from the primitive stock. As time went on these primitive Carnivora became more clearly differentiated, so that in the Miocene epoch all the modern families are easily distinguishable. (See Fig. 8.)

<sup>1</sup> Besides these seven families there are a few rare and peculiar Carnivora which are placed in families by themselves, but these are of no geological importance and need not be considered here.

## URSIDÆ, OR BEARS.

The Ursidæ, or Bears, are the largest living Carnivora, and are not exceeded in size by any one of the extinct forms. They are less strictly carnivorous than most of the others, since they live in large part upon berries, nuts, roots and other vegetable food. The Polar Bear is an exception, feeding entirely upon animal food, fish and seals. Skulls of two extinct bears are shown in the collection, the Californian and European Cave-Bears.

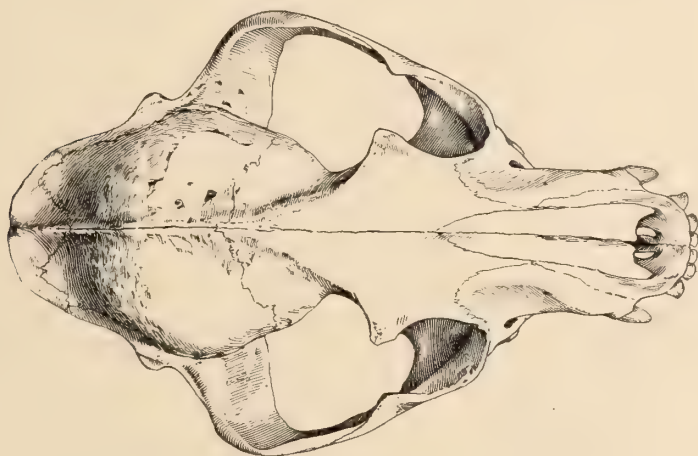


FIG. 13. TOP VIEW OF SKULL OF PHLAOCYON

A link between raccoons and primitive dogs. Lower Miocene of Colorado. Natural size

These get their name from the fact that their remains are chiefly found in caves, where they hibernated, probably, during the cold season, as do modern bears.

## PROCYONIDÆ, OR RACCOONS.

The Procyonidæ are found only in North and South America, with the exception of the Panda of India, which is doubtfully referred to this family. Fossil raccoons very much like the living species are found in the Pleistocene strata of various parts of the United States, and in cave deposits. In the Oligocene and Miocene epochs lived two more primitive genera which



illustrate the evolution of these animals from the primitive civet-like Carnivora of the Eocene epoch. The Miocene stage, *Leptarctus*, is very little known; only a lower jaw and an upper tooth have been found. Of the Oligocene stage, *Phlaocyon*, a nearly complete skeleton was found in 1898, of which the skull, jaws, limbs and feet are on exhibition. This unique specimen is one of the best preserved fossil Carnivores in the collection. It is intermediate between the civet-like ancestors of the dogs (*Daphenus* and *Cynodictis*) and the modern raccoons. The

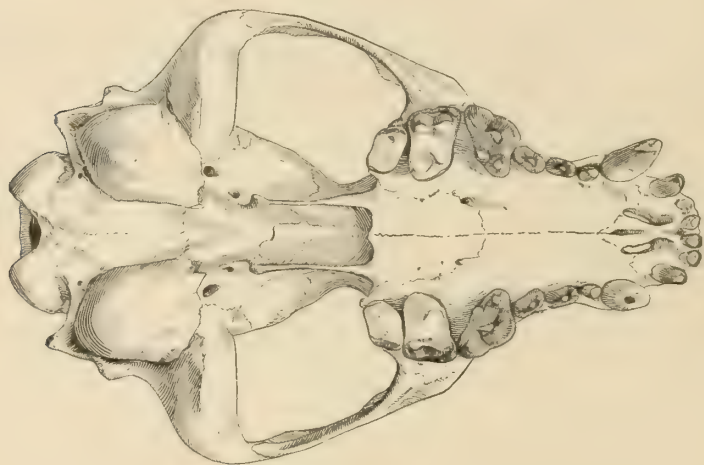


FIG. 14. UNDER SIDE OF SKULL OF PHLAOCYON

A link between raccoons and primitive dogs. Lower Miocene of Colorado. Natural size

shape of the skull is raccoon-like, but the number of teeth is the same as in the dogs, while their form is intermediate between the two types. The limbs and feet are also intermediate. It is probable, therefore, that the Dogs and Raccoons are derived from a common ancestral stock. Specimens found in Europe indicate that the Bears are likewise derived from this common stock, and that the three families have diverged, the Dogs becoming terrestrial flesh-eaters, living largely in open country, the Bears omnivorous and living in the woods, the Raccoons omnivorous and arboreal.

## CANIDÆ, OR DOGS.

The living species of Canidæ—Wolves, Coyotes, Foxes—are found only in the most recent deposits (Pleistocene). A great variety of extinct species is known, some of which are the ancestors of modern forms, while others belong to side branches which have not survived. Most remarkable of these side branches were the Amphicyons or Bear-like Dogs, some of which were of huge size, equalling the modern Polar Bear—see skull and backbone of *Dinocyon* in wall-case No. 8. A large series of skulls of vari-

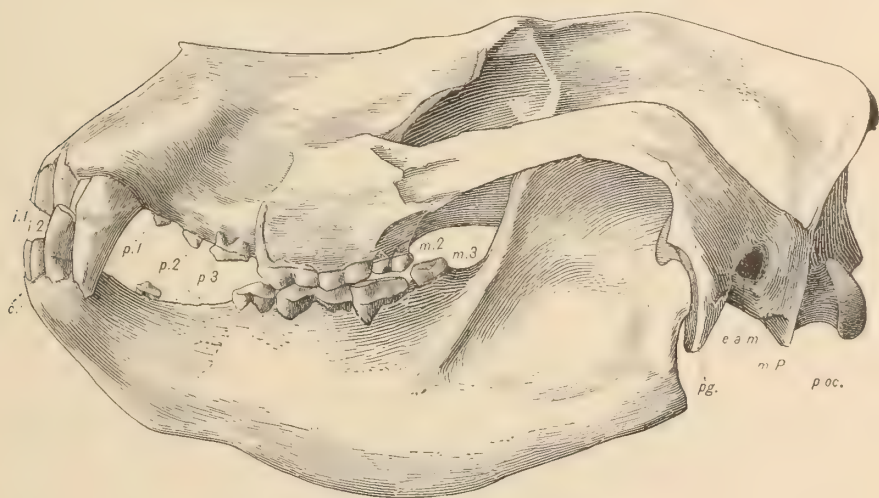


FIG. 15. SKULL OF DINOCYON

A gigantic extinct dog from the Upper Miocene of Texas. One-fourth natural size

ous extinct Dogs of the Oligocene and Miocene epochs is shown in the table-case. These indicate the evolution of the modern species from animals much more like the Civets in proportions and in the character of their teeth. It has been possible to trace out the probable direct lineage of at least two of the modern dogs, the Dhole of India, and certain South American foxes, through these North American fossil species. Other fossil species belong to races of Canids now extinct.

The increase in brain capacity from ancient to modern animals is well shown in this series of skulls. All ancient Dogs had small brains of inferior organization to their modern descendants.

## VIVERRAVIDÆ.

Type: *Viverravus*, skull etc. Table-case.

The Viverravidæ resemble the modern Civets more nearly than any other modern Carnivora. They differ from them in fact in various primitive characters not very noticeable. The brain-case is much smaller in proportion; the scaphoid and lunar bones are sometimes not united; but the form and number of the teeth and proportions of the body were not different from those of modern Civets, except that the skull was larger and the limbs were shorter. They were probably the ancestors of the modern Carnivora, except the Cat family. (See Fig 8.)

## VIVERRIDÆ, OR CIVETS.

A few specimens of fossil Civets from Europe are shown in the collection. They are not found fossil in America, but it is probable that they are descended, without much change in character, from the Viverravidæ shown in the opposite side of the same table-case.

## MUSTELIDÆ, OR MUSTELINES.

Types: *Bunælorus*, *Plesictis*, *Mustela*, *Conepatus*, skulls.

The Mustelines are mostly small or of medium size, savage and blood-thirsty, solitary and forest-loving or aquatic. The Otters are aquatic and live mainly on fish; the Badgers are burrowing animals, and live mainly on burrowing rodents etc.; the Martens, Ferrets and Skunks are arboreal and terrestrial.

These different kinds of Mustelines seem to have separated as early as the Oligocene epoch, for even then we find Martens, Skunks and Otters distinguishable. But they were much more alike then than now, and all of them have many characters linking them with the Civets, indicating that the two families had a common origin. Compare the difference in teeth between *Bunælorus* and *Potamotherium* with the difference between their modern descendants the Marten and the Otter; also compare the *Bunælorus* teeth and skull with those of a civet. Note also the comparatively small brains of the Oligocene Mustelines as *Bunælorus* and *Plesictis*. Their Miocene descendants (e. g., *Mustela ogygia*

skull) had larger brain capacity, and the modern forms still larger and better-developed brains. This indicates that slow but steady

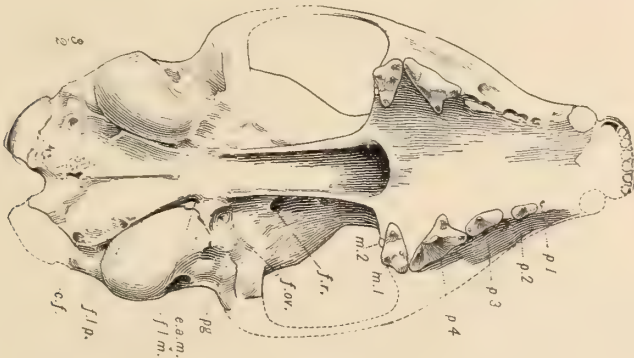


FIG. 16. SKULL OF THE PRIMITIVE MUSTELINE BUNÆLORUS

Oligocene of Colorado. Three-halves natural size. Viewed from the under side to show the teeth

increase in intelligence which has occurred in almost all the lines of evolution among quadrupeds. *Superiority of brain is the final test by which, in the long run, the persistence of a race is decided.*

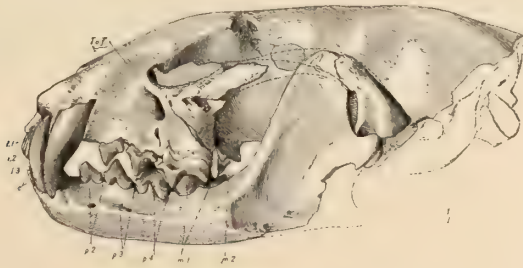


FIG. 17. SKULL OF MUSTELA OGYGIA

An extinct species of marten, from the Middle Miocene of Colorado. Side view, natural size

## FELIDÆ, OR CATS.

### (Sabre-Tooth Tigers)

Types: the mounted skeletons of *Smilodon* and *Hoplophoneus*, skeleton of *Dinictis* in block, skulls of *Hoplophoneus*, *Dinictis*, *Archælorus*.

Almost all the fossil Cats belong to a division now extinct, in which the upper canine teeth were enlarged into great curving, flattened, sharp-edged tusks, sometimes seven inches long.

*Smilodon* of the Pleistocene epoch was as large as a polar bear, and exceedingly muscular, especially in the great massive fore-limbs. The claws in the mounted skeleton (upright case) are larger than the largest lion claws. One of the great tusks is complete, the other was broken off during the lifetime of the



FIG. 18. THE GREAT SABRE-TOOTH TIGER, *SMILODON*  
Pleistocene of South America. Restoration by Wolff. Courtesy of Dr. Elliott

animal, for the stump shows evidence of considerable wear after it was broken. This skeleton was found near Buenos Aires in Argentina along with the remains of gigantic ground-sloths (*Megatherium*) and tortoise-armadillos (*Glyptodon*) which may well have been the prey of this most terrible of all the Carnivora. But the *Smilodons* ranged all over the New World, and like the nearly allied *Machcerodus*, which was distributed over all the northern continents, were contemporaries of primitive man. Whether our palæolithic ancestors ventured to contend with this gigantic foe, we do not know, but the structure of its skeleton indicates that, although more powerful than the lion and the



tiger, it was not nearly so active and intelligent, and that it was fitted to prey upon the slow-moving giant pachyderms of the Quaternary rather than upon active, alert and intelligent animals, least of all perhaps upon man. In the extinction of the Sabre-Tooth Tiger we may rather regret the passing away of a singular and magnificent type of the beasts of prey than rejoice over the disappearance of a dangerous enemy to the human race.

The ancestral Sabre-Tooth Tigers of the older geological epochs were smaller and less specialized. The skeleton of *Hop-*



FIG. 19. SKULL AND LOWER JAW OF DINICTIS  
Primitive Sabre-Tooth Tiger from the Oligocene of Colorado. One-half natural size

*lophoneus* illustrates their general character and size. This is the most perfect specimen in the collection, every bone being present, and all, with a few unimportant exceptions, complete and perfectly preserved. *Hoplophoneus* was proportioned somewhat like a leopard, but with shorter smaller limbs and very short spreading feet. *Dinictis* had longer limbs, but the teeth were less specialized. *Archaelurus* and *Nimravus* were more primitive types, linking the Sabre-Tooth with the ancestors of the true Cats.

*Habits of the Sabre-Tooth Tigers.* The modern great Cats kill their prey usually by biting it in the neck so as to break the spinal column. They pursue as a rule the long-necked, thin-skinned

ruminants, which are the most abundant herbivores of to-day, seldom molesting the short-necked, thick-skinned pachyderms such as the rhinoceros and the elephant. The Sabre-Tooth appears to have used his great canine fangs in a quite different method of attack; the whole structure of the animal indicates that he struck them forcibly into the side of his prey, the mouth gaping wide meanwhile, and then presumably withdrew them with a ripping, tearing stroke, leaving a great gash whereby a



FIG. 20. THE HEAD OF SMILODON. OUTLINE RESTORATION  
To show the widely gaping jaw. By Chas. R. Knight

large animal would soon bleed to death. By this method he would be peculiarly fitted to attack the great pachyderms, with which his exceptional muscular strength especially fitted him to cope while his lack of speed and agility would render him much less dangerous to the swift-footed ruminants and horses of the time. We may infer therefore that, while the true Cats were evolved to prey upon the larger swift running quadrupeds and developed speed and agility to catch their prey, the Sabre-Tooth was evolved to prey upon the powerful and massive contingent of the Herbivora, and developed enormous muscular strength and peculiar weapons of attack to cope with these animals.

The true Cats are not common as fossils, and our collections

contain only a few fragmentary specimens. They can be traced back as far as the Oligocene epoch, without any great change in character, but their earlier history is a blank. It appears probable that they are derived along with the Sabre-Tooth Tigers from some undiscovered group of Creodonts more nearly related to *Palæonictis* than to any other known fossil type.

#### HYÆNIDÆ, OR HYÆNAS.

Fossil Hyænas are common in the cave deposits of the Old World, but none have been found in this country. In the older formations of Europe there has been found a series of extinct forms which appear to connect the Hyænas with primitive Civets (*Ictitherium*, *Palhyæna*). These are not represented in our collections.

#### C. PINNIPEDIA, OR SEALS.

This group of Carnivora is exclusively adapted to marine life. They are found fossil in sediments of marine origin, but are very rare, and nothing is known of their evolution. They are almost unrepresented in our collections. An incomplete skull of an extinct species of Walrus found near Atlantic City, N. J., shows that the range of this animal formerly extended much farther south than now.

### II. CHIROPTERA, OR BATS.

The Bats are the only mammals capable of true flight, although there are certain kinds of squirrels, marsupials and the so-called "flying lemurs," which can extend portions of the skin into a sort of parachute to assist them in taking long leaps from bough to bough. The wings of Bats are chiefly an extension of the skin membrane between the fingers, which are greatly elongated; those of birds on the contrary are chiefly composed of feathers which grow from the whole length of the arm and hand, although mainly from the second digit of the hand.

Fossil remains of Bats are exceedingly rare except in cave deposits, and do not teach us much about the evolution of this singular group of mammals. They resemble the Insectivora more than any other

order in teeth and skull, but we know practically nothing of when or how the great wing-membranes were developed, except that they must have been of very ancient origin, for in the Oligocene epoch this feature was as fully formed as now. A few fragmentary jaws and wing bones are shown in the collection.

### III. INSECTIVORA.

Hedgehogs, Moles, Shrews etc. Table-case.

Small mammals of rather inferior organization with claws on the toes five digits on each foot, simple teeth with sharp cusps on the crowns and no gnawing teeth.

The Insectivora are an order of animals defeated and disappearing in the struggle for existence, owing to the superior

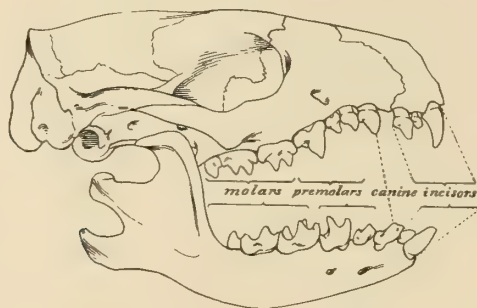


FIG. 21. SKULL OF THE HEDGEHOG.  
A surviving type of the insectivora. Natural size

intelligence or better adaptation of their competitors. To escape utter destruction they have been forced into one or another peculiar mode of existence or method of defense, or have been driven to take refuge in the remoter corners of continents or in oceanic islands, where competition is less severe. The Hedgehogs have survived by virtue of their stout and efficient prickly coat, which deters almost any carnivorous animal from meddling with them. The Moles have taken refuge in the earth, where their rivals are few, and they are out of reach of most enemies. The Shrews are partly protected by their unpleasant odor, partly by their small size, nocturnal habits and burrowing or otherwise

concealing themselves. The other Insectivora are inhabitants of the larger tropical islands—Cuba, Madagascar and some East Indian islands—or of South Africa, but have disappeared from the great northern continents, Europe, Asia and North America, where the struggle for existence has been most severe and where all the higher types of mammals have been evolved.

The Insectivora are a very ancient order of mammals, and in past geological periods they were of more importance than now; in fact they have been considered by many scientists as representing more nearly than any other living order the primitive central group from which all other mammals have descended. Through the "Age of Mammals" they progressed less than most other orders and several families of them became extinct during that time, while the Moles and Shrews diverged from nearly similar habits to their present peculiarities, and the Hedgehogs, probably, acquired their coat of spines.

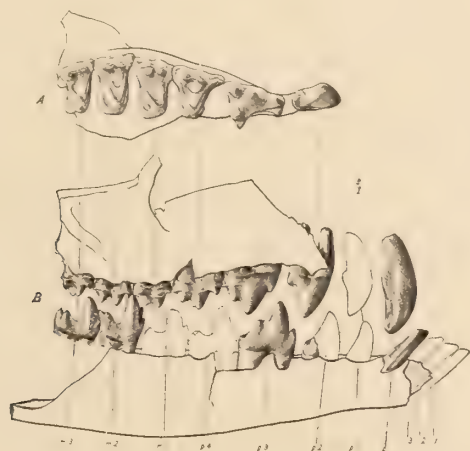


FIG. 22. ICTOPS ACUTIDENS

Upper and lower teeth, showing the "tritubercular" molars. Oligocene Epoch, Montana.  
Twice natural size

### LEPTICTIDÆ, OR PRIMITIVE HEDGEHOGS. Extinct.

Tritubercular molar teeth. Two incisors in upper dentition. Premolars unreduced, the last one molariform. Tibia and fibula fused, ulna and radius separate. Size and proportions like the modern



Hedgehog, skull long and pointed. Eocene and Oligocene epochs, North America.

A series of skulls of these little animals is shown in the table case. They differ from the true Hedgehogs in many archaic characters and there is no reason to suppose that they wore a prickly coat. The "tritubercular" teeth are a primitive characteristic.

#### ERINACEIDÆ, OR HEDGEHOGS. Living.

Quadritubercular molar teeth. Three incisors in upper dentition. Premolars often small, sometimes reduced in number, the last one molariform. Tibia and fibula united, ulna and radius separate. Skull rather short in the Hedgehog, long and pointed in certain allied East Indian animals. Oligocene to Recent epochs, Europe and America.

Part of the skull of a true Hedgehog of an extinct genus, *Proterix*, from the Oligocene of South Dakota, is shown in the table case, besides jaws of the Miocene genus *Galerix* from Europe.

#### TUPAJIDÆ, OR TREE-SHREWS.

Living. Borneo.

#### MACROSCOLIDÆ, OR JUMPING-SHREWS.

Living. Africa.

#### SORICIDÆ, OR SHREWS.

Living. Europe, Asia, northern Africa and North America.

Incisors and premolars reduced in number, the incisors forming a pair of sharp-pointed pincers, molars quadritubercular. No zygomatic arch. Oligocene to Recent. Europe and North America.

More than half of the species of living Insectivora come under this family, but all are of small size, mostly nocturnal, hiding in burrows or beneath leaves or roots during the day. They feed on insects, for which purpose the pincer-like incisors and the sharp little cusps of the molar teeth are well adapted. Fossil Shrews are found in the Oligocene and later formations of both Europe and North America, but only fragmentary remains have been discovered. A few are on exhibition.

TALPIDÆ, OR MOLES.

Living. Europe, Asia, northern Africa and North America.  
Eocene to Recent in Europe and North America.

Completely subterranean; fossorial or burrowing. Incisors not pincer-like. A zygomatic arch present. Fore-limb very short and powerful, specialized for digging.

A small skull of a primitive Mole, *Proscalops*, from the Miocene of Colorado is on exhibition. It is Shrew-like in several respects, showing an approach between the now distinct families of Moles and Shrews. Other fragmentary remains of Moles are shown.

POTAMO GALIDÆ.

Living. Madagascar and West Africa. Aquatic animals with long eel-like tails.

## SOLENODONTIDÆ.

Living. Cuba and Hayti.

CENTETIDÆ.

Living. Madagascar.

Fossil species supposed to be related to these animals are found in the Eocene (*Centetodon*) and Lower Oligocene (*Microp-*

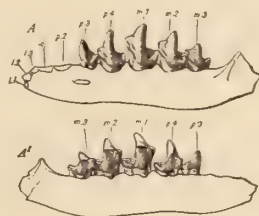


FIG. 23. MICROPTERNODUS BOREALIS

A small and primitive extinct insectivore. Lower jaw, inner and outer view, twice natural size.  
Oligocene Epoch, Montana

## CHRYSOCHLORIDÆ.

Living. South Africa.

These are known as Cape Golden Moles and take the place of the true Moles in South Africa. A fossil species has been found in the Miocene of Patagonia, indicating that they formerly inhabited both southern continents.

## ADAPISORICIDÆ.

Extinct. Lower Eocene. France. Imperfectly known.

## DIMYLIDÆ.

Extinct. Lower Miocene. Europe.

Only two molars in upper and lower jaw, the second quite small. Premolars reduced, no canine. Jaws are exhibited in the table-case.

## IV. RODENTIA, OR GNAWERS.

Mice, Squirrels, Beavers, Hares, Porcupines etc.

Small mammals with claws on the toes, five digits on each foot, the teeth reduced in number, a pair of upper and lower incisors specialized for gnawing. The gnawing teeth grow continually from per-

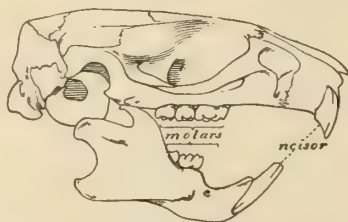


FIG. 24. SKULL OF THE RAT

The most familiar type of the rodentia. Natural size

sistent pulps, during the lifetime of the animal. They have enamel only on the anterior surface and wear to a chisel-like edge which is continually renewed by the more rapid wear of the dentine behind the enamel.

The Rodents are the most numerous group of mammals, but they are almost all small. There are probably now more different

species of rodents than of all the other mammals put together, and they are found in all sorts of places; some are terrestrial, others arboreal, others fossorial or subterranean, others amphibious. They live chiefly on vegetable food, such as grasses, fruit and nuts.

During the Tertiary period Rodents were probably equally numerous; but their remains are so small that they are apt to escape the attention of collectors. Even so they are among the most common of fossil mammals. Most of them belong to families still living.

MURIDÆ. Rats, Mice, Muskrats, Meadow-mice etc.

This is the largest group of the Rodents; there are more than 170 recognized species in North America alone. Several species have been found rather abundant in the American Badland formations. In the White River beds, *Eumys*, allied to the White-footed Mouse, is common; *Paciculus*, allied to the Wood-Rat, is found in the John Day beds; Muskrats and Meadow-mice occur in the Pleistocene.

GEOMYIDÆ. Pocket Gophers.

Found only in North America. Fossil Pocket Gophers occur in the John Day and later formations in the Western States.

HETEROMYIDÆ. Pocket Mice.

Found only in North America. Fossil Pocket Mice are rather common in the White River and John Day formations.

SCIURIDÆ. Squirrels, Prairie Dogs, Woodchucks etc.

Fossil Squirrels, not easily distinguishable from the modern forms, are found in the Oligocene and later formations of the United States. Prairie-Dogs occur in the Pleistocene.

HAPLODONTIIDÆ, OR SEWELLELS. Oligocene to Recent.

The Sewellel, or Mountain Beaver, is a peculiar little burrowing Rodent found only in the western Coast Region of North

America. A tiny fossil Rodent, *Meniscomys* of the Oligocene epoch, is thought to be ancestral to it.

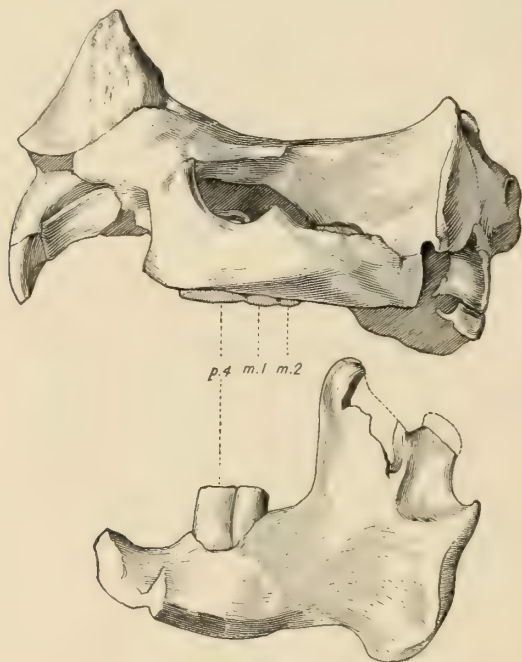


FIG. 25 THE HORNED RODENT, CERATOGAULUS  
Skull and lower jaw. Middle Miocene of Colorado. Natural size

#### MYLAGAULIDÆ. Extinct. Miocene.

Curious little Rodents with digging claws on the fore-feet, very wide short head and peculiar teeth. One skull in the case, the *Ceratogaulus*, or Horned Rodent, shows a large boss indicating a horn on the nose, which gives it an odd likeness to a rhinoceros skull. They are very rare fossils, found only in North America.

#### CASTORIDÆ. Beavers. Oligocene to Recent.

Fossil Beavers of small size have been found in the Tertiary beds of both America and Europe and several skulls are shown in the collection. In the Quaternary beds are found remains of Beavers scarcely to be distinguished from the living species.



## ISCHYROMYIDÆ

Extinct. Eocene and Oligocene.

These were Rodents with teeth more or less like Squirrels, but with skulls more like those of Porcupines and Beavers. They are more ancient than any living rodent families, for they were common in the Lower and Middle Eocene, while no other rodents appear until the Upper Eocene. Several skulls and parts of skeletons of *Ischyromys*, *Paramys* etc. are on exhibition.

## CASTOROIDIDÆ.

Extinct. Pleistocene.

Intermediate between beavers and hystricomorphs, but of very large size. *Castor ohioensis* equalled a black bear in size. A skull and jaw of this rare animal are shown in wall case No. 8. Its remains are usually found in bogs, along with those of the mastodon.

## SOUTH AMERICAN RODENTS.

All the extinct and most of the living Rodents of South America belong to a division more nearly related to the porcupine than to anything else. Some of the living ones, as the Paca and Capybara are of quite large size.

A series of skulls and jaws of extinct rodents from the Miocene of South America is exhibited in the table-case.

There are certain extinct European Rodent families which are thought to be more nearly related to the South American Rodents than to any others, and the remains of several of these forms are exhibited in the case for comparison beside them.

## LEPORIDÆ. HARES AND RABBITS.

In the White River Badlands remains of fossil Hares are very abundant. They are more primitive than the modern species in the construction of the teeth, and are placed in the genus *Palæolagus* ("Ancient Hare"). In the later formations of America the rabbits belong to the modern genus *Lepus*.

## LAGOMYIDÆ. Picas, or Tailless Hares.

These are little animals looking like small Rabbits, but have fewer teeth. They are found in high mountain regions in the Old World and likewise in western North America. They have

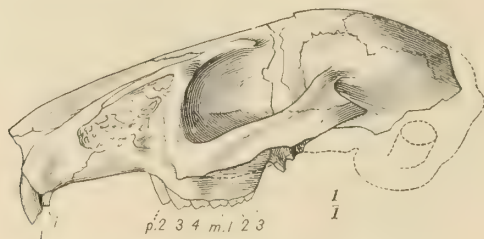


FIG. 26. SKULL OF PALÆOLAGUS  
An ancestor of the hares. Oligocene of Colorado. Natural size

been found fossil in Europe, but in America occur only in the latest geological epoch; in the Old World they seem to have taken the place of the true Hares, which were limited to the New World until the end of the Tertiary period.

## V. MARSUPIALIA.

All the living marsupials are inhabitants of Australia and the adjacent islands, except the Opossums and a rare genus of Rat-

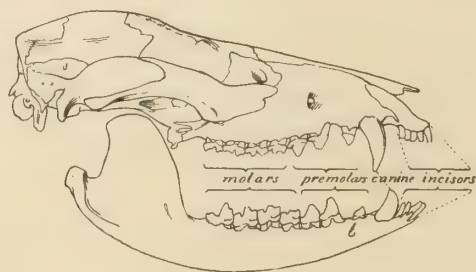


FIG. 27. SKULL OF THE OPOSSUM  
Shows the peculiar dentition of the marsupials. Half natural size

Kangaroos from South America. In Australasia they take the place of the mammals of the other continents, none of which occurs

there.<sup>1</sup> Fossil marsupials related to the existing ones of the same region are found in Australia; one gigantic extinct Wombat, *Diprotodon*, is shown in case 6. In South America in the Miocene strata are found remains of various carnivorous marsupials and also of Rat-Kangaroos; a skull and other materials are shown in the collection. In the Eocene and Oligocene of Europe and North America, are found small jaws scarcely to be separated from those of the Opossum except by size. The primitive trituberculates of the Cretaceous period, in the table-case, may also have been marsupials.

## VI. MULTITUBERCULATES.

This ancient group of mammals lived during the Age of Reptiles, and became extinct at the beginning of the Age of Mammals. Only jaws, teeth and other fragmentary remains have been found, and it is quite uncertain whether the group is related to the Marsupials or to the Monotremes (*Ornithorhynchus* etc.). Some resemble the Marsupial Rat-Kangaroos, others mimic the Rodents in form. The largest and best known is *Polymastodon* of the basal Eocene; the oldest shown in the case is the tiny *Ctenacodon* of the Jurassic period. *Chirox* and *Ptilodus* of the Cretaceous and basal Eocene are most like the Rat-Kangaroos.

## VII. MESOZOIC TRITUBERCULATES.

A number of very small and fragmentary jaws and teeth of Trituberculates from strata of the Jurassic and Cretaceous periods of the Age of Reptiles are exhibited here. They are interesting because they are the most ancient of mammals and show the method of their evolution from reptilian ancestors. Some are thought to be related to the Marsupials, others more nearly to the Insectivores, but until more perfect specimens are found, little can really be stated with certainty about them. Enlarged models of three of these specimens are shown in the case, besides casts and original specimens of many more.

<sup>1</sup> The only exceptions are the dingo, or wild dog, which was probably introduced by man and a few small rodents and bats.

The *Dromatherium* and *Microconodon* casts and models represent two little jaws which are the oldest mammals known. They were found in the Triassic coal-beds of North Carolina, and have a type of teeth intermediate between the primitive three-cusped form of mammals and the simple one-cusped tooth of Reptiles.

### THE ORIGIN OF MAMMALS.

The several groups of small and mostly primitive mammals which we have gone over in this guide-leaflet furnish a great deal of evidence, direct and indirect, as to the characters and appearance of the ancestral group or groups from which all mammals are supposed to be descended.

The most ancient mammals, the Multituberculates and Mesozoic Trituberculates of the Age of Reptiles, are known only from rare and very fragmentary remains and many more or less contradictory hypotheses have been advocated as to the relations of these little known groups to the Tertiary mammals which succeeded them and to the lower vertebrates (reptiles and amphibians) which preceded them in geological history. The consensus of present opinion is that mammals in general evolved from an unknown stock of reptiles most nearly related to the Theriodontia<sup>1</sup> which flourished at the end of the Palæozoic era; that they soon split into two branches, one of which (Monotremes) survives without very great change in the egg-laying mammals of Australia. The other more progressive branch again split, one division giving rise to the Marsupials, the other to the Placentals, the latter including all the remaining groups of mammals. The Multituberculates represent a side branch, but whether of Marsupials or of Monotremes is uncertain. The Trituberculates of the Mesozoic era were more nearly in the direct line; some appear to be in the Marsupial branch, others more doubtfully in the Placental branch. But all these conclusions are largely hypothetical.

When we come to the Tertiary mammals, we can speak much more certainly, as these are far more completely known. All the modern races of mammals, as we trace them back towards their

<sup>1</sup> Exhibited in the Hall of Fossil Reptiles, south side.

beginnings, approximate more and more towards a central type which is most nearly represented among known fossils by the earliest Creodonta (*Oxycænidae*) of the dawn of the Tertiary. The Insectivora and Rodentia are also groups of mammals which in most respects have not departed very far from this primitive type. Its general characters are, (1) Small size; (2) Small brain of low organization; (3) Forty-four teeth of simple construction, with sharp cusps, the molars, premolars, canines and incisors of different form, the molars having the "tritubercular" pattern; (4) Limbs and neck flexible and of moderate length, tail very long and powerful, probably prehensile; (5) Feet with five digits on each foot, claws on the toes, the thumb more or less opposable.

These characters appear to indicate an arboreal mode of life rather than any other, and we may suppose that during the Age of Reptiles the ancestors of the mammals were tree-living animals, feeding chiefly upon insects. They were insignificant in size and unimportant in numbers, quite overshadowed by the great and numerous reptilian fauna which flourished during that long era. They possessed, however, the two most important elements of final success in the evolutionary struggle; a brain which, though inferior to that of their descendants, was superior to the brain of all other contemporary vertebrates, and a construction of the joints of limbs and feet more mechanically perfect than in any other animals. By the further improvement and elaboration of these factors of success, they were enabled to displace all their rivals, and become dominant upon land and to some extent upon the sea. Their invasion of the aerial province, already occupied by the highly developed and specialized birds, has been less successful, but of the once dominant reptile fauna of the land, almost nothing remains. The triumphant mammals have branched and re-branched, diverged into countless specializations in adaptation to peculiar modes of life, some of which have survived, while others have become extinct, but always the prime factors of success in the long run have been those which gave them their original advantage over their reptile competitors. Finally the truth that the supremacy in intelligence is first in importance, is best illustrated by the present dominance of man over the whole terrestrial world.



## BIBLIOGRAPHY.

This Guide is based principally upon the various scientific studies of specimens in this collection, carried on mostly by members of the staff of this department, which have been published in the Bulletin and Memoirs of the Museum. Upon request, copies of these publications will be loaned to students and others interested in the subject of fossil mammals.

The following books are recommended for collateral reading:

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FIG. 1. MOUNTED SKELETON OF BRONTOSAURUS IN THE AMERICAN MUSEUM OF NATURAL HISTORY

# The Mounted Skeleton of Brontosaurus

in the American Museum  
of Natural History.

A Guide Leaflet to the Collections  
in the  
Department of Vertebrate Palæontology.

By

W. D. MATTHEW, PH.D.,

ASSOCIATE CURATOR OF VERTEBRATE PALÆONTOLOGY.

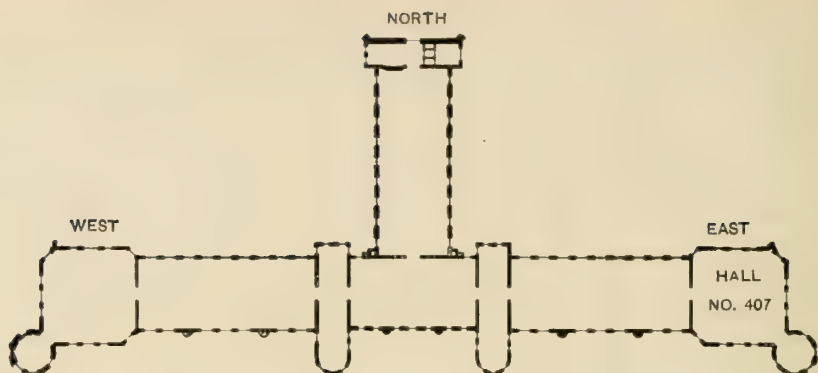
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**GUIDE LEAFLET No. 18.**

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL,

VOLUME V, No. 2, APRIL, 1905.

New York, Published by the Museum,



### FOURTH FLOOR.

The Mounted Skeleton of Brontosaurus described in this Guide Leaflet is exhibited in Hall No. 407, the Dinosaur Hall, South-East Wing, fourth floor of the Museum.

### PREFATORY NOTE

THE collections in the Dinosaur Hall were gathered together and prepared for exhibition under direction of Professor Henry Fairfield Osborn, Curator of the Department, Vice-President and Trustee of the Museum. They include the Cope Collection of Fossil Reptiles and Amphibians, presented in 1902 by Morris K. Jesup, and the collections brought together by Museum Expeditions to the various Rocky Mountain States where the richest localities for such specimens are found. The funds for these expeditions are provided by the generosity of the Trustees of the Museum.

Besides the general guide to the Collection of Fossil Vertebrates, re-issued in October, 1903, a series of special guides is in course of preparation. Each of these treats of one or more important groups of animals, their evolution, and the various problems and theories illustrated by the specimens in the hall, more fully than could be done in the general guide. Two of these special guides have been published, one dealing with the evolution of the Horse, the other with the Fossil Carnivores, Marsupials and Small Mammals. A special guide to the Dinosaurs is planned, to be issued in three or more sections, which will be prepared as soon as the collections are more permanently and completely installed.

EDITOR.

## THE MOUNTED SKELETON OF BRONTOSAURUS.

BY W. D. MATTHEW.



EIGHT years ago the American Museum began a search for fossil reptiles in the Rocky Mountain States. The prime object of the search was to obtain skeletons of the Dinosaurs, those gigantic extinct animals whose fragmentary remains, discovered in that region and studied and described especially by the late Professor Marsh, have excited the greatest interest among men of science. In order to place these marvels of an antique world before the public in tangible form, a Dinosaur Hall was planned, in which should be exhibited mounted skeletons of the principal kinds of Dinosaurs. To obtain these, a series of expeditions into the regions of the arid West, where such fossils are to be found, was inaugurated and carried on under direction of Professor Osborn, and the collections of the late Professor Cope, containing three splendid skeletons of Dinosaurs, were purchased through the liberality of President Jesup.

This programme involved an amount of work hardly to be appreciated by outsiders, and it is as yet far from being complete. Nevertheless, the mounting of the largest skeleton, the Amphibious Dinosaur Brontosaurus, has been finished, the skeleton of a remarkable dwarf Dinosaur, the "Bird-Catcher," has been mounted and placed on exhibition, the preparation and mounting of entire skeletons of three other large and very extraordinary types (the Carnivorous, Duck-billed and Armored Dinosaurs) are well under way, and diligent search is being made for complete and mountable skeletons of other important kinds. Many other more fragmentary specimens have been found, some of which are exhibited in the wall-cases around the hall.

Visitors see here the largest fossil skeleton that has ever been mounted, and may obtain some idea of the variety and the extraordinary character of the animals which populated the earth during the Age of Reptiles, millions of years ago, before the Age of Mammals had begun or the various races of quadrupeds which now inhabit the world had commenced their evolution.

The Brontosaurus skeleton, the principal feature of the hall, is sixty-six feet eight inches in length, and stands fifteen feet two inches high. Its petrified thigh-bone weighs 570 lbs. The weight of the animal when alive is estimated at not less than ninety tons. About one-third of the skeleton, including the skull, is restored in plaster, modeled or cast from other incomplete skeletons. The remaining two-thirds belong to one individual, except for a part of the tail, one shoulder-blade and one hind limb, supplied from another skeleton of the same species.

The skeleton was discovered by Mr. Walter Granger, of the Museum expedition of 1898, about nine miles north of Medicine Bow, Wyoming. It took the whole of the succeeding summer to extract it from the rock, pack it and ship it to the Museum. Nearly two years were consumed in removing the matrix, piecing together and cementing the brittle and shattered petrified bone, strengthening it so that it would bear handling, and restoring the missing parts of the bones in tinted plaster. The articulation and mounting of the skeleton and modeling of the missing bones took an even longer time, so that it was not until February, 1905, that the Brontosaurus was at last ready for exhibition.

It will appear, therefore, that the collection, preparation and mounting of this gigantic fossil has been a task of extraordinary difficulty. No museum has ever before attempted to mount so large a fossil skeleton, and the great weight and fragile character of the bones made it necessary to devise especial methods to give each bone a rigid and complete support, as otherwise it would soon break in pieces from its own weight. The proper articulating of the bones and the posing of the limbs were equally difficult problems, for the Amphibious Dinosaurs, to which this animal belongs, disappeared from the earth long before the dawn of the Age of Mammals, and their nearest relatives, the living



lizards, crocodiles, etc., are so remote from them in either proportions or habits that they are unsatisfactory guides in determining how the bones were articulated, and are of but little use in posing the limbs and other parts of the body in positions that they must have taken during life. Nor among the higher



FIG. 2. SKELETON OF BRONTOSAURUS IN THE QUARRY

Showing three sections of the backbone partly covered with plaster bandages for transportation to the Museum. The ribs have already been removed from the near side of the backbone. Tools used in the work lie scattered about the quarry.

animals of modern time is there one which has any analogy in appearance or habits of life to those which we have been obliged by the study of the skeleton to ascribe to the *Brontosaurus*.

As far as the backbone and ribs were concerned, the articulating surfaces of the bones were a sufficient guide to enable us to pose this part of the skeleton properly. The limb-joints, however, are so imperfect, that we could not in this way make sure of having the bones in a correct position. The following method, therefore, was adopted:

A dissection and thorough study was made by the writer, with the assistance of Mr. Granger, of the limbs of alligators and

other reptiles, and the position, size and action of the principal muscles were carefully worked out. Then the corresponding bones of the Brontosaurus were studied and the position and size of the attachments of the corresponding muscles were marked out, so far as they could be recognized from the scars and processes preserved on the bone. The Brontosaurus limbs were then provisionally articulated and posed, and the position and size of each muscle were represented by a broad strip of paper extending from its origin to its insertion. The action and play of the muscles on the limb of the Brontosaurus could then be studied, and the bones adjusted until a proper and mechanically correct pose was reached. The limbs were then permanently mounted in these poses, and the skeleton as it stands is believed to represent, as nearly as study of the fossil enables us to know, a characteristic position that the animal actually assumed during life.

The Brontosaurus was one of the largest of the Amphibious Dinosaurs or Sauropoda, a race of gigantic reptiles which flourished during the Jurassic or Middle Period of the Age of Reptiles, some eight millions of years ago by a moderate estimate of geological time. These Amphibious Dinosaurs are more ancient than any of the extinct mammals in the adjoining hall (No. 406), except for a few tiny jaws in the Small Mammal Alcove. They were the largest animals that ever lived, excepting some of the whales, and certainly were the largest animals that ever walked on four legs.

In proportions and appearance the Brontosaurus was quite unlike any living animal. It had a long thick tail like the lizards and crocodiles, a long flexible neck like an ostrich, a thick, short, slab-sided body and straight, massive, post-like limbs suggesting the elephant, and a remarkably small head for the size of the beast. The ribs, limb-bones and tail-bones are exceptionally solid and heavy; the vertebrae of the back and neck, and the skull, on the contrary, are constructed so as to combine the minimum of weight with the large surface necessary for attachment of the huge muscles, the largest possible articulating surfaces, and the necessary strength at all points of strain. For this purpose they are constructed with an elaborate system of

braces and buttresses of thin bony plates connecting the broad articulating surfaces and muscular attachments, all the bone between these thin plates being hollowed into a complicated



FIG. 3. MODEL OF BRONTOSAURUS. BY CHARLES R. KNIGHT, 1905  
Executed from the mounted skeleton, under direction of Professor H. F. Osborn

system of air-cavities. This remarkable construction can be best seen in the unmounted skeleton of *Camarasaurus*, another Amphibious Dinosaur.

The teeth of the *Brontosaurus* indicate that it was an herbivorous animal feeding on soft vegetable food. Three opinions as to the habitat of Amphibious Dinosaurs have been held by scientific authorities. The first, advocated by Professor Owen, who described the first specimens found forty years ago, and supported especially by Professor Cope, has been most generally adopted. This regards the animals as spending their lives entirely in shallow water, partly immersed, wading about on the bottom or, perhaps, occasionally swimming, but unable to emerge entirely upon dry land. More recently Professor Osborn has advocated the view that they resorted occasionally to the land for egg-laying or other purposes, and still more recently the view has been taken by Mr. Riggs and the late Mr. Hatcher that they were chiefly terrestrial animals. The writer inclines to the view of Owen and Cope, whose unequalled knowledge of comparative anatomy renders their opinion on this doubtful question especially authoritative.

The contrast between the massive structure of the limb-bones, ribs and tail, and the light construction of the backbone, neck

and skull, suggests that the animal was amphibious, living chiefly in shallow water, where it could wade about on the bottom, feeding on the abundant vegetation of the coastal swamps and marshes, and pretty much out of reach of the powerful and active Carnivorous Dinosaurs which were its principal enemies.



FIG. 4. RESTORATION OF BRONTOSAURUS. BY CHARLES R. KNIGHT

This restoration represents Professor Osborn's view of the habits of the animal

The water would buoy up the massive body and prevent its weight from pressing too heavily on the imperfect joints of the limb- and foot-bones, which were covered during life with thick cartilage, like the joints of whales, seals and other aquatic animals. If the full weight of the animal came on these imperfect joints, the cartilage would yield and the ends of the bones would grind against each other, thus preventing the limb from moving without tearing the joint to pieces. The massive, solid limb- and foot-bones weighted the limbs while immersed in water, and served the same purpose as the lead in a diver's shoes, enabling the Brontosaurus to walk about firmly and securely under water. On the other hand, the joints of the neck and back are exceptionally broad, well-fitting and covered with a much thinner



surface of cartilage. The pressure was thus much better distributed over the joint, and the full weight of the part of the animal above water (reduced as it was by the cellular construction of the bones) might be borne on these joints without the cartilage giving away.

Looking at the mounted skeleton we may see that if a line be drawn from the hip-joint to the shoulder-blade, all the bones below this are massive, all above (including neck and head) are lightly constructed. This line then may be taken to indicate the average water-line, so to speak, of this Leviathan of the Shallows. The long neck, however, would enable the animal to wade to a considerable depth, and it might forage for food either in the branches or the tops of trees or, more probably, among the soft succulent water-plants of the bottom. The row of short, spoon-shaped, stubby teeth around the front of the mouth would serve to bite or pull off soft leaves and water-plants, but the animal evidently could not masticate its food, and must have swallowed it without chewing, as do modern reptiles and birds.

The brain-case occupies only a small part of the back of the skull, so that the brain must have been small even for a reptile, and its organization (as inferred from the form of the brain-cast) indicates a very low grade of intelligence. Much larger than the brain proper was the spinal cord, especially in the region of the sacrum, controlling most of the reflex and involuntary actions of the huge organism. Hence we can best regard the Brontosaurus as a great, slow-moving animal-automaton, a vast store-house of organized matter directed chiefly or solely by instinct and to a very limited degree, if at all, by conscious intelligence. Its huge size and its imperfect organization, as compared with the great quadrupeds of to-day, rendered its movements slow and clumsy; its small and low brain shows that it must have been automatic, instinctive and unintelligent.

#### COMPOSITION OF THIS SKELETON.

The principal specimen, No. 460, is from the Nine Mile Crossing of the Little Medicine Bow River, Wyoming. It consists of the 5th, 6th and 8th to 13th cervical vertebræ, 1st to 6th dorsal and 3d to 19th caudal vertebræ, all the ribs, both coracoids, parts of sacrum and ilia, both ischia and pubes, left femur



and astragalus and part of left fibula. The backbone and most of the neck of this specimen were found articulated together in the quarry, the ribs of one side in position, the remainder of the bones scattered around them, and some of the tail-bones weathered out on the surface.

From No. 222, found at Como Bluffs, Wyo., were supplied the right scapula, 10th dorsal vertebra, and right femur and tibia.

No. 339, from Bone Cabin Quarry, Wyo., supplied the 20th to 40th caudal vertebrae; No. 502, from the same locality, the metatarsals of the right hind foot, and a few toe-bones are supplied from other specimens.

The remainder of the skeleton is modeled in plaster, the scapula, humerus, radius and ulna from the skeleton in the Yale Museum, the rest principally from specimens in our own collections. The modeling of the skull is based in part upon a smaller incomplete skull in the Yale Museum, but principally upon the complete skull of *Morosaurus* shown in Case 42.

Mounted by A. Hermann; completed Feb. 10, 1905.





AMERICAN MUSEUM OF NATURAL HISTORY

The  
Reptiles of the Vicinity  
of  
New York City



BY

Raymond L. Ditmars

Curator of Reptiles, New York Zoological Park

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL

VOL. V, No. 3, JULY, 1905

Guide Leaflet No. 19

# American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

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THE AMERICAN MUSEUM OF NATURAL HISTORY was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people, and it is in cordial coöperation with all similar institutions throughout the world. The Museum authorities are dependent upon private subscriptions and the dues from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world.

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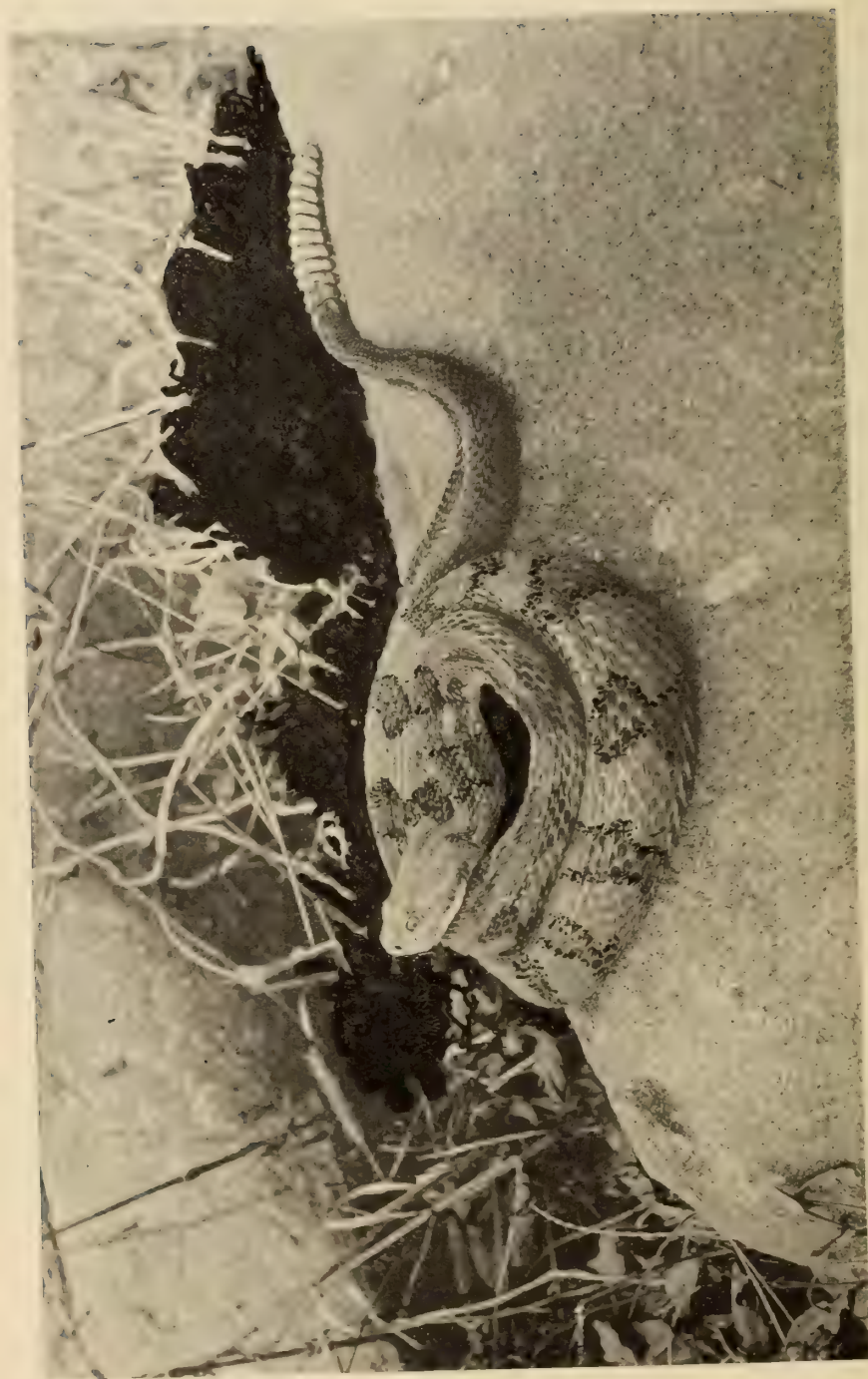


FIG. 1. BANDED RATTLESNAKE

The  
Reptiles of the Vicinity  
of  
New York City

With Reference to the Collection in the  
American Museum of Natural History.

By  
RAYMOND L. DITMARS,  
CURATOR OF REPTILES, NEW YORK ZOÖLOGICAL PARK.

**GUIDE LEAFLET No. 19.**

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL,

VOLUME V, No. 3, JULY, 1905.

New York. Published by the Museum.

## PREFATORY NOTE.

The Museum gratefully acknowledges the coöperation of the New York Zoölogical Society in the preparation of this Leaflet. The author is Curator of Reptiles at the New York Zoölogical Park, Bronx Park. Through Director W. T. Hornaday the abundant living material of the Zoölogical Park was placed at the disposition of the Museum for the purpose of making photographs for the illustrations; and through Director C. H. Townsend similar courtesies were extended at the New York Aquarium, Battery Park.

Mention should also be made of the valuable assistance rendered by Mr. Herbert Lang of the Museum, who took the photographs from which thirty-seven of the half-tone illustrations (Figs. 4-8, 10-12, 16, 17, 21-47) were prepared. The remaining photographs were furnished by the author.

The collection to which the Leaflet refers may be found at present in the Synoptic Hall, No. 107 of the ground floor of the Museum building. The animals may be seen in the flesh at the Zoölogical Park and the Aquarium.

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## THE REPTILES OF THE VICINITY OF NEW YORK CITY.<sup>1</sup>

BY RAYMOND L. DITMARS,

Curator of Reptiles, New York Zoölogical Park.

### INTRODUCTION.

IN compiling this guide for the identification of the local reptiles, the writer has endeavored to present the subject in a simple and concise manner, avoiding technicalities as far as possible. The usual descriptions of reptiles concern arrangements of the scales upon the head and certain other physical characteristics that are necessarily associated with technical terms, but the keys for identifications and descriptions of the species in the present work appeal principally to the *coloration* and *form* of the reptiles. With but a limited number of species to consider, this plan seems appropriate, since it greatly simplifies the subject.

The reptiles described are those which have been found within a radius of about fifty miles of New York City. Within this section 28 species are represented. Of these species 14 are serpents, 2 are lizards and 12 are turtles. Thus our local fauna may be said to be quite rich in reptile life. In fact, it is within the limits of the area described that certain species of snakes (the Garter Snake, *Thamnophis sirtalis*, and the Brown Snake, *Storeria dekayi*) abound to such an extent that hundreds of specimens are annually killed and captured without apparent decrease in their numbers.

There are but two local species of poisonous snakes, the Banded Rattlesnake and the Copperhead. In certain districts both are fairly abundant, but may be hardly called a menace to mankind, as one is shy and retiring in habits, while the other

<sup>1</sup> Reprinted from *The American Museum Journal*, Vol. V, No. 3, July, 1905.

evinces an unmistakable characteristic of warning. There are but few records of the bites of venomous snakes in this portion of the United States.

### SNAKES.

#### Order *Ophidia*.

The snakes are well represented in the Atlantic states, fourteen species being distributed through sections of the region surrounding New York City. Some of these reptiles attain fair dimensions, and several of the species are brilliantly colored. Two are venomous and of sufficient size to be formidable to man. These dangerous snakes, the Rattlesnake and the Copperhead Snake, may be recognized by their triangular heads which are quite distinct from the neck. The blunt tail of the Rattlesnake, terminating in its warning appendage, is a character hardly possible to be overlooked by the most indifferent observer. The Copperhead Snake is so strongly marked that identification is but the question of a moment's intelligent examination after an idea of the color pattern has been acquired.

Several of our harmless snakes have been provided with eccentric and misleading titles. To those unacquainted with reptiles, such species as the "Flat-headed Adder," the "Spotted Adder," the "Water Moccasin" and others of equally formidable appellation might be regarded as reptiles not entirely devoid of harm. Many of our harmless snakes which are of substantial economic importance in the destruction of the smaller injurious mammals possess the most evil reputation, although they really aid the agriculturist. The slaughter of these useful reptiles by the misinformed is a genuine calamity.

In the key to the identification of the local snakes, the attention of the student is especially directed to *color* and the *formation of scales*. Snakes are either provided with *smooth* or *keeled* scales, the latter having a distinct ridge, or keel, running lengthwise. The Garter Snake and the Water Snake are examples of snakes possessing *keeled* scales. This simple plan makes identification easy, and excludes the usual technical reference to the complicated arrangement of the scales or shields of the head, which requires technical knowledge for satisfactory

comprehension. To aid in this idea, the species are grouped in the key without regard to technical classification.

*Key to the Snakes.*<sup>1</sup>

a. SCALES SMOOTH.

*Size small.*

Light brown above; pinkish beneath;  
snout conical.....**Worm Snake** (*Carpho-*  
*phis amœnus*).

Pale green above; white beneath....**Green Snake** (*Cyclo-*  
*phis vernalis*).

Dark gray above; a yellow ring  
around the neck; yellow beneath..**Ring-necked Snake**  
(*Diodophis puncta-*  
*tus*).

*Size moderate.*

Gray, with chestnut saddles above;  
beneath white, with square spots of  
black.....**Milk Snake** (*Lampro-*  
*peltis doliatius trian-*  
*gulus*).

*Size large.*

Uniform satiny black above; black  
beneath, with the chin and throat  
white.....**Black Snake** (*Bascan-*  
*ion constrictor*).

aa. SCALES OF THE BACK FEEBLY KEELED.

*Size large.*

Black above; beneath white, blotched  
with gray; scales of the sides show  
white edges.....**Pilot Blacksnake** (*Co-*  
*luber obsoletus*).

b. SCALES KEELED.

*Size small.*

Brown above; pink beneath.....**DeKay's Snake** (*Sto-*  
*reria dekayi*).

Brown or gray above; bright red  
beneath.....**Storer's Snake** (*S. oc-*  
*cipito-maculata*).

Dark brown or black above, with a  
yellow stripe down the back and a  
similar stripe on each side on third  
and fourth rows of scales from  
underside.....**Ribbon Snake** (*Tham-*  
*nophis saurita*).

<sup>1</sup> All of the local harmless snakes have eyes with round pupils. The two species of local poisonous snakes have elliptical (cat-like) pupils.

*Size moderate.*

Dark brown or black above, with a yellowish stripe down the back and a light stripe on each side on second and third rows of scales from under-side.....**Garter Snake** (*Thamnophis sirtalis*).

Dark brown or gray above, with reddish transverse bands; white or yellow beneath spotted with red...**Water Snake** (*Natrix fasciata sipedon*).

Dark yellow or brown, with darker transverse markings; snout upturned and sharp.....**Hog-nosed Snake** (*Heterodon platyrhinus*).

*Head triangular, distinct from neck.*

Light chestnut brown or pinkish-gray, with a series of dark brown transverse bands, narrow on the back and becoming wide on the sides.....**Copperhead Snake** (*Agkistrodon contortrix*).

Yellow, with dark transverse bands; sometimes dark tan or uniform black; tail ending in a rattle.....**Banded Rattlesnake** (*Crotalus horridus*)



FIG. 2. HEAD OF DIAMOND-BACKED RATTLESNAKE. SOUTHERN STATES



# DESCRIPTIVE LIST OF THE SNAKES.

## HARMLESS SPECIES.



FIG. 3. WORM SNAKE

The Worm Snake, *Carphophis amoenus* (Fig. 3), is a diminutive species which, though fairly abundant, is seldom seen, owing to its secretive habits. The Worm Snake is quite characteristic in appearance with its smooth, shining, cylindrical body and sharp snout; the head and neck are of the same width. In color this little serpent is quite somber and in harmony with the surroundings in which it lives. Above, it is light brown or brownish gray; beneath, the color is a delicate shade of pink. In length, the species seldom exceeds eleven inches.

This reptile might possibly be confounded with the Storer's Snake and the DeKay's Snake, which small, retiring species it in a way resembles, principally in color and size, but it may be immediately recognized by its smooth scales; both of the other

species having keeled scales. The Worm Snake frequents damp localities and soft, loose ground, where it burrows with the aid of its sharp snout. Specimens are sometimes found in decaying logs. It is seldom found wandering about above the surface, except among damp leaves or after showers. The food consists largely of earthworms and soft grubs. This snake is oviparous.

*Range:* Central and eastern United States.

*Local distribution:* Long Island; Palisades of the Hudson.



FIG. 4. MILK SNAKE

The Milk Snake, *Lampropeltis doliatus triangulus* (Figs. 4 and 5), is one of the most brightly colored of the local snakes.

**Milk Snake.** The body above is yellowish brown or gray, with a series of irregular chestnut-brown or reddish spots edged with black, about fifty in number; on the sides are smaller spots in alternation with those of the back. Beneath, the reptile is white, with numerous, small oblong spots of black. The length, when mature, is from three to four feet. The scales are smooth and polished.

Although this species is generally distributed, it is not of common occurrence. From a habit of sometimes frequenting the neighborhood of stables and dairies, it has acquired the reputation of obtaining milk from the cows. This is an illogical



FIG. 5. MILK SNAKE ; WITH EGGS

theory, and proof of the actual deed from reputable observers is wanting. In captivity this serpent is wholly indifferent to milk, but will eat mice, young birds and small snakes other than its own species. It is a constrictor and closely related to the King Snake of the southern states. The Milk Snake is oviparous, laying eggs to the number of two dozen or more.

*Range:* The central and eastern United States; Canada.

*Local distribution:* General; frequents woods.

The Ring-Necked Snake, *Diadophis punctatus* (Fig. 6), is the most easily distinguished of the various local snakes. The scales of this little reptile are smooth and shining, while the body is a uniform dark gray or bluish black, with a brilliant yellow ring around the neck immediately behind the head. Beneath, the color is orange yellow; a single row of black spots is generally present. The length seldom exceeds fifteen inches.

Ring-  
Necked  
Snake.

These little snakes may be occasionally found in damp woods, under stones or burrowing under the bark of decaying trees. The species is quite rare within the limits under

consideration, but in some portions of the Hudson Highlands and in the Catskill Mountains it is rather abundant. In the southern states it is very common, the writer having taken several hundred specimens within a few days' time by stripping the bark from old, fallen trees. The Ring-necked Snake feeds largely upon earthworms and the smaller species of salamanders. It is oviparous.

*Range:* The United States east of the Rocky Mountains; Canada.



FIG. 6. RING-NECKED SNAKE

*Local distribution:* General.

Dainty and inoffensive both in looks and habits, the little Green Snake, *Cyclophis vernalis* (Fig. 7), may be easily known by its color which makes it quite distinct from other local species. The color above is a uniform pale green and beneath is light yellow or white. The scales are smooth and possess a satiny luster.

The Green Snake differs from the majority of serpents in being insectivorous. It feeds largely upon hairless caterpillars, although it also consumes crickets, grasshoppers and spiders. The usual length of the animal is about two feet. This species is oviparous.





FIG. 7. GREEN SNAKE



FIG. 8. BLACK SNAKE



*Range:* The United States east of the Rocky Mountains; Canada.

*Local distribution:* Common in Rockland, Dutchess and adjoining counties.

With the exception of one other species, the Black Snake, *Bascanion constrictor* (Fig. 8), attains the largest dimensions of any of the local serpents. Above and beneath, with the exception of the chin and throat, this reptile is a uniform black, the smooth scales imparting to the creature's back a luster similar to that of a gun-barrel. The chin and throat are milky white.

Young specimens show a remarkable variation from the adult snake. Like all the snakes described thus far, the Black Snake is an egg-laying species (oviparous). As is the case with the majority of the oviparous snakes, the eggs are left by the parent to be hatched by the heat of the sun or of decomposing vegetation. At the time of hatching, the young Black Snake belies its name. The body is pale gray with a series of brownish blotches down the back; the head and sides are irregularly spotted with black. At this stage it closely resembles the Milk Snake, but may be distinguished therefrom by the tendency of the blotches on the back to become very narrow as they approach the tail and to disappear almost altogether on that appendage. When a year old, the body color has become very dark, but close inspection will reveal the dorsal blotches. As age progresses the body color becomes darker until it assumes the intense black of the adult.

Extremely agile and feeding upon small rodents, birds, frogs and other snakes, the Black Snake is not a constrictor as its technical name implies, nor is it nearly so courageous as is generally supposed. When surprised, this reptile will invariably take to flight if this be possible, and few serpents can show the speed of this black meteor as it darts away, to stop only when apparent safety is attained. When cornered and escape is cut off, this snake will fight bravely, but the slightest opening is instantly taken advantage of by a dash for cover. The needle-like teeth can produce nothing but the most superficial wounds, yet this serpent is quite generally dreaded. Without doubt the

Black Snake is of value in the woods and fields, since its appetite craves the smaller mammals which are a menace to the agriculturist. The average length of adult specimens is between five and six feet.

*Range:* The entire United States and southern portions of Canada.<sup>1</sup>

*Local distribution:* General, in rocky localities.



FIG. 9. PILOT BLACKSNAKE

The Pilot Blacksnake; Mountain Blacksnake, *Coluber obsoletus* (Fig. 9), attains the greatest length of any of the snakes embraced in the present list. This species is a powerful constrictor, and is the northern representative of the large and brilliantly-colored Rat Snakes of the South.

To the novice this serpent might appear similar to the preceding species. This similarity, however, applies only to color. Unlike the Black Snake or Racer, the scales are polished and the body presents a metallic, shining appearance instead of a satiny luster.

<sup>1</sup> The typical (black) form inhabits the Eastern States; a variety of lighter color frequents the Middle States; in the Western States is the variety called the Green Racer (*B. constrictor flaviventris*).

The general color above is black, the scales of the sides showing white edges when the body is distended. Beneath, the color is white, blotched with gray on the forward portion; posteriorly the gray becomes suffused over the entire surface; the chin and throat are white and immaculate. Close examination will reveal the scales of the back to be faintly keeled, which characteristic at once separates the species from the Black Snake. The head is broad and rather flat; the under surface of the body is so abruptly flattened as to form right angles with the sides.

This species is built rather for climbing than for speed, and generally frequents low bushes, where it lies in wait for birds and small mammals. The species attains a length of more than six feet. It is oviparous.

*Range:* Eastern United States from Maine to Florida; the Central States; in the South the species extends westward to Texas.

*Local distribution:* Highlands of the Hudson; not common.

The Hog-nosed Snake, *Heterodon platyrhinus* (Figs. 10 and 11), may be recognized by its sharp, upturned snout, which shovel-like appendage is employed to assist the reptile in burrowing in the sandy soil in which it lives. The markings of this peculiar snake are extremely variable, but the color is generally yellowish brown, with dark brown or black irregular cross-bands. Some specimens show brilliant shades of yellow and red; others are entirely black. The latter constitute the variety *niger*.

**Hog-nosed  
Snake.**

The species is stout in body, and the scales are keeled. When annoyed, it assumes a threatening attitude by flattening the head and neck and hissing loudly. In spite of its hostile demeanor, it seldom attempts to bite, but contents itself by endeavoring to frighten the object of its annoyance by its eccentric antics. In different localities the species has been given appellations that have placed this harmless reptile in bad repute. Such names as "Flat-headed Adder," "Blowing Viper" and "Spreading Adder" are energetically used by the farmer who usually refuses to be convinced that this snake is not akin in poisonous faculties to the Copperhead, to which it bears some resemblance in proportions and markings.





FIG. 10. HOG-NOSED SNAKE



FIG. 11. HOG-NOSED SNAKE (VAR. NIGER)

When repeatedly annoyed, this snake will feign death and may then be roughly handled without its displaying signs of life. Its food consists principally of toads. The species is oviparous, depositing about two dozen eggs. A large specimen will measure three feet in length and one and a half inches in diameter.

*Range:* The United States east of the Rocky Mountains.

*Local distribution:* Found in nearly all the sandy localities adjacent to New York City. Common on Long Island and the Bayonne peninsula, New Jersey.



FIG. 12. RIBBON SNAKE

The Ribbon Snake, *Thamnophis saurita* (Fig. 12), is a species which might be easily confounded with the Garter Snake, owing to the similarity of markings. The body color is dark brown or black, with a bright and very clearly-defined stripe of yellow down the back and a similar stripe on each side. The body is very slender and the scales are distinctly keeled. When the skin is distended the sides of the body show small, white spots.

The chief differences between this species and the Garter



Snake are the following: 1. The stripes on the sides are situated on the third and fourth rows of scales from the plates of the crawling surface; with the Garter Snake the lateral stripe is situated on the second and third rows of scales. 2. The underside is immaculate, while the abdomen of the Garter Snake shows a row of small black spots on each side. 3. The Ribbon Snake is, in proportion, considerably more slender than the other species.

The active little Ribbon Snake frequents damp meadows and woods. It seldom exceeds three feet in length. Its food consists

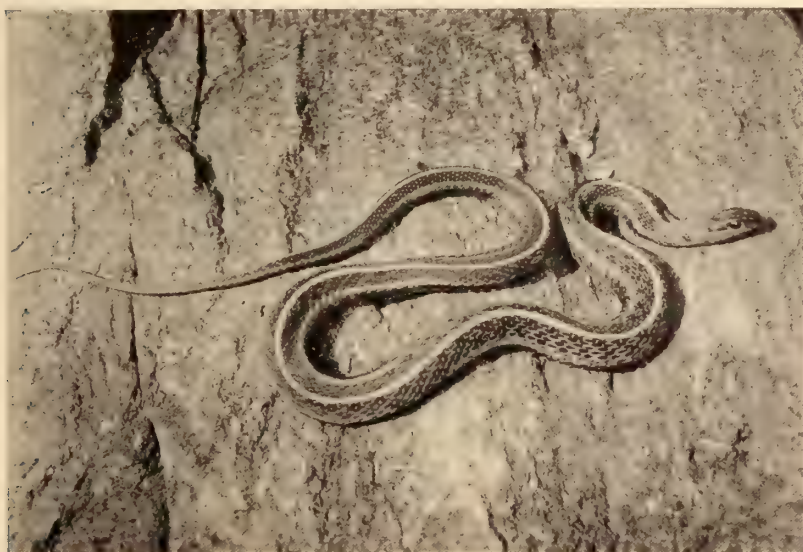


FIG. 13. GARTER SNAKE

of small fishes, tadpoles and frogs. The species is viviparous, but the number of young is small, seldom amounting to a dozen.

*Range:* Southeastern Canada and the United States east of the Rocky Mountains.

*Local distribution:* General, but not common.

The Garter Snake, *Thamnophis sirtalis* (Fig. 13), is the most common of our local serpents. The general color above is dark-brown or black, with three yellowish stripes running lengthwise; beneath, the color is greenish yellow.

**Garter  
Snake.**

The skin along the sides when distended shows numerous white

or greenish spots. The scales are strongly keeled. The species varies in color; specimens are occasionally found upon which the stripe on the back is indistinct or entirely wanting; others present a spotted appearance between the stripes.

Abundant under various conditions of swamp, woods and rocky localities, the Garter Snake will continue to exist within our local borders long after many of the other species of serpents have been exterminated by the ruthless slaughter that unjust prejudice inspires. The species is viviparous, bringing forth as many as thirty or more living young at a brood. The young reptiles feed upon earthworms and grow rapidly. While immature, these snakes are secretive, and the character of their food enables them to obtain a livelihood without prowling forth into danger. Far different is the case of the active young Blacksnake in search of mice, as it crosses roads and clearings into the danger zone of stones and clubs.

The adult Garter Snake feeds mostly upon frogs and toads; birds and small mammals are never devoured by this species. The length of a large specimen is about a yard.

*Range:* North America, southward to Guatemala.

*Local distribution:* General and common; is found in the large parks of New York City.

Our common Water Snake, *Natrix fasciata sipedon* (Fig. 14), is a variety of a species abundant in the southern states. The **Water Snake.** body is rather stout, with strongly keeled scales; the color is brown with broad irregular cross-bands of reddish brown which show more distinctly on the sides. The underside is yellowish white, brightly marked with red spots and blotches. The young of this species are quite different from the adult in coloration, the body color being gray with the cross-bands black and very distinct. The adult attains a length of four feet and a diameter of two inches. From two and a half to three feet long, however, is the usual size.

Always frequenting the vicinity of water, this snake may be seen in numbers along slow-running streams, either sunning itself on the banks or stretched upon the branches of bushes that overhang the water. It feeds upon fishes, frogs and toads. The Water Snake is viviparous, bringing forth as many as forty

or more young at a litter. The young are born during the latter part of August and early in September.

*Range:* The eastern United States from Maine to North Carolina.

*Local distribution:* Common near ponds, streams and salt-water marshes.



FIG. 14. WATER SNAKE

Among the local snakes, DeKay's Snake, or Brown Snake, *Storeria dekayi* (Fig. 15), is unique in surviving in localities where the other serpents have long since been exterminated. It is common in many portions of the large city parks, where its secretive habits, diminutive size and quiet colors aid in its protection.

**Brown  
Snake.**

In color this reptile is brown or brownish gray above, with a minute series of black spots in pairs usually present down the back; the space between these spots is sometimes of a lighter tint than the body color, producing the appearance of an indistinct stripe in some specimens; beneath, the color is pinkish white. The scales are keeled. The average length of adult specimens is twelve inches.

This snake is most frequently found hiding under flat stones, and in such places the reptile searches for its favorite food, which consists of earthworms.

The Brown Snake is viviparous, producing from fifteen to eighteen young during August. During the first year the young snakes are very dark with a whitish ring around the neck. At this stage they resemble the young of the Ring-Necked Snake,



FIG. 15. DEKAY'S, OR BROWN SNAKE

but they may be distinguished therefrom by their keeled scales. When adult, the average length of the Brown Snake is about fourteen inches.

*Range:* Canada and the eastern United States from the Atlantic coast westward to Kansas and southward to Mexico.

*Local distribution:* Common in rocky localities.

The Storer's Snake, or Red-Bellied Snake, *Storeria occipito-maculata* (Fig. 16), closely resembles the Brown Snake, but may

**Red-Bellied  
Snake.**

be distinguished therefrom by its bright vermilion underside. Down the back of Storer's Snake there is usually a well-defined stripe of a lighter shade than the body color, which is brown or dark gray; occasionally specimens are slaty gray with a light stripe down the back bordered with rows of minute black spots. On such specimens the bright red of the underside is especially intense. It is a smaller species



than the preceding, seldom attaining a length of more than eleven inches. The young are produced alive, and are black with a whitish ring around the neck.

*Range:* The same as the preceding species, but may extend farther north in Canada.



FIG. 16. STORER'S, OR RED-BELLIED SNAKE

*Local distribution:* Not found within the immediate vicinity of New York City, but is common northward; occurs abundantly in Orange, Rockland and Putnam Counties.

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POISONOUS SPECIES.

The Copperhead Snake, *Ancistrodon contortrix* (Fig. 17), is a strongly marked species and easily determined. The body color is light chestnut brown, sometimes assuming a Copper-tinge of pink, crossed with dark, reddish-brown bands, head Snake. which are narrow on the back and wide on the sides, resembling from above the outlines of a dumb-bell; these bands are darkest at their edges, particularly on the sides of the body. The head is somewhat lighter than the body, usually exhibiting a coppery tinge or a bright hazel brown; the sides of the head are of a still



paler hue. The line of intersection of the lighter color with the coppery tints of the top begins behind the eye and runs to the angle of the mouth. Beneath, the body is pinkish white, with two rows of reddish-brown blotches; the scales are keeled; the pupil of the eye is elliptical.<sup>1</sup>

Although the head of this serpent is triangular and distinct from the neck, the general appearance of the reptile would not immediately lead the uninitiated to class it as a poisonous snake. Several of our local serpents are quite as heavy in body as the

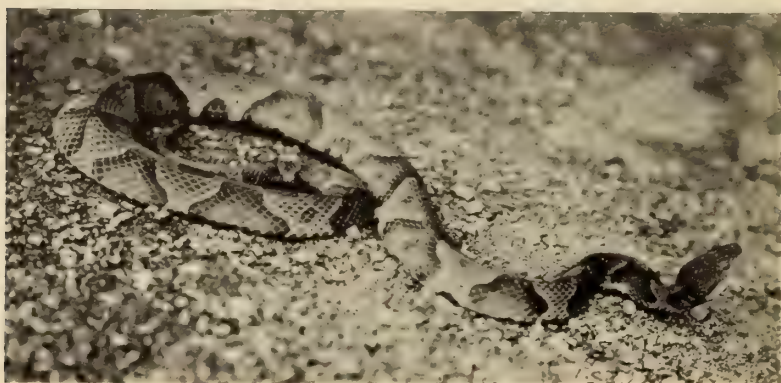


FIG. 17. COPPERHEAD SNAKE

formidable Copperhead. The Milk Snake, the Hog-nosed Snake and the Water Snake are sometimes confounded with the Copperhead, partly on account of a similarity of pattern, and partly on account of the stout bodies of the last two species. From the Milk Snake the Copperhead may be at once distinguished by its keeled scales; from the Hog-nosed Snake and the Water Snake by the arrangement of the plates under the tail.<sup>2</sup> Beginning from the vent, these broad plates in the harmless reptiles are in two rows; in the Copperhead they are arranged in one row, extending across the underside of the tail like the plates of the belly, with the exception (in some specimens) of a few scattered, divided plates near the tip of the tail. From all the harmless snakes the Copperhead may be distinguished by the presence of a

<sup>1</sup> The eyes of all of our harmless snakes have round pupils.

<sup>2</sup> The sub-caudal plates of all the harmless snakes are in two rows.

pit between the eye and the nostril, a characteristic of the crotaline snakes that has led to their popular title, "the Pit Vipers."

The upper jaw of the Copperhead is provided with two long fangs which fold against the roof of the mouth when the latter is closed. These teeth are hollow and are provided with an opening at the tip for the ejection of poison. They are precisely the same in their formation as the needle of a hypodermic syringe. The poison is secreted in glands behind the reptile's eyes, and is forced through the fangs by muscular contraction during the act of biting.

The Copperhead is the most beautiful of our local snakes, its delicate colors so closely resembling the falling leaves of autumn that it is with difficulty to be distinguished from its surroundings at that time of the year. When annoyed, it imparts a rapid, vibratory movement to the tail, which when among dried leaves produces a distinct rattling, audible for several feet. Its bite is very dangerous, but the snake is not habitually hostile and it prefers flight to combat. When cornered, however, it will fight bravely, striking from a partly coiled position. The food of this snake consists of small mammals, birds and frogs. From six to nine young are produced alive during August or early in September. The tails of the young snakes are bright sulphur-yellow, which tint gradually fades as the reptile matures. A large adult specimen will measure three feet in length.

*Range:* Massachusetts to Florida, westward to Texas.

*Local distribution:* Palisades of the Hudson River, northern Westchester, Rockland, Putnam and Orange Counties, N. Y. Prefers thick, damp woods and in some districts (Orange and Rockland Counties) is moderately abundant.

With the rattle as an unvarying characteristic, the dangerous Banded Rattlesnake, *Crotalus horridus* (Figs. 1 and 18), may be instantly recognized. Female specimens are generally sulphur-yellow or brown, with black, or dark-brown transverse bands; the males are usually very dark brown or black with little trace of the bands, except yellow markings that show the location of the borders of the transverse blotches. The scales are roughly keeled. The head is triangular and covered with small, irregular scales.

**Banded  
Rattle-  
snake.**

The young are produced during the latter part of August to the number of about a dozen. They grow rapidly and acquire, on an average, three joints of the rattle every year; the young snakes are born with a single "button" on the tail. The average length of a mature snake of this species is from three and a half to four feet.

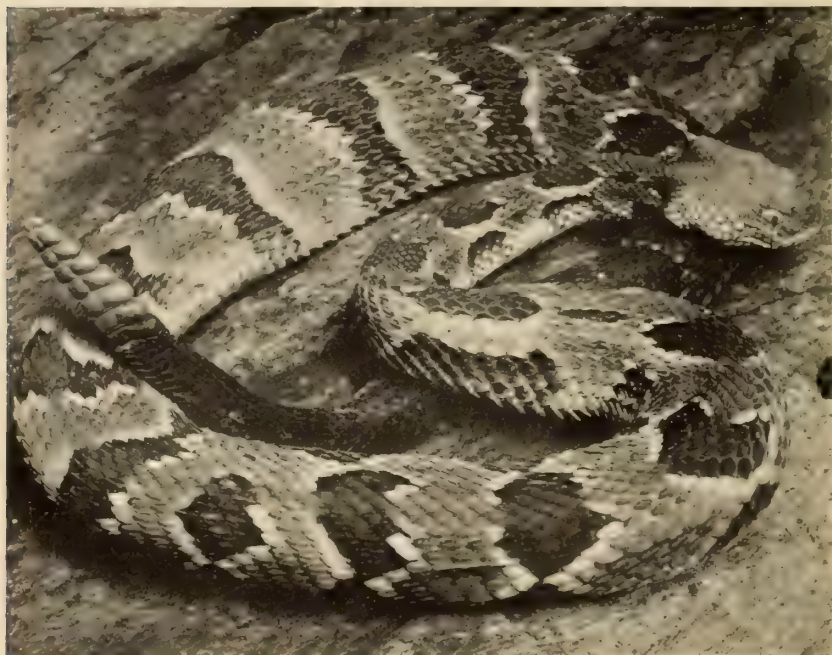


FIG. 18. BANDED RATTLESNAKE

Subsisting upon larger prey, such as squirrels, rats, young rabbits and birds, the Rattlesnake is a bolder reptile than the Copperhead. Provided with proportionately longer fangs and a more virulent poison, the bite of this species is more dangerous than the former. It generally frequents rocky localities and has a wide range of distribution.

*Range:* Massachusetts to northern Florida, and westward to Texas.

*Local distribution:* Within fifty miles of New York City, the Rattlesnake is now very scarce. Occasional specimens are reported from Putnam County.

# LIZARDS.

Order *Lacertilia*.

The local Lizards, which number two species, are so different in general aspect that immediate identification is possible even to the novice. The smooth, shining Blue-tailed Lizard and the rough, somber-tinted Fence Swift are the examples. The occurrence of the latter species is rare within the limits embraced by this list. Both species are very active, and are insectivorous in habits.

## Key to the Lizards.

### a. BODY SMOOTH AND SHINING:

Two phases—

aa. Body black, with five yellow stripes; tail blue.....*Young*.

ab. Body brown; stripes indistinct or wanting; head reddish.....*Mature*.

aa and ab.....**Blue-tailed Lizard**  
(*Eumeces quinquelineatus*).

### b. BODY ROUGH; THE SCALES KEELED:

Gray or brown with lighter blotches..

**Fence Swift** (*Sceloporus undulatus*).

## DESCRIPTIVE LIST OF THE LIZARDS.

The Blue-tailed Lizard, *Eumeces quinquelineatus* (Fig. 19), is an active species, generally distributed. It may be readily recognized by its smooth, shining scales and bright colors. There are two phases of coloring, one representing young individuals and the other the fully matured animals. Young specimens are black, with five bright

**Blue-tailed  
Lizard.**



yellow stripes running lengthwise on the body; the tail of such specimens is usually a brilliant blue,—hence the name. Upon approaching maturity the body assumes a brownish tinge, the stripes become less distinct, and upon the males disappear altogether, while the head takes on a tinge of red. The females retain the stripes, although they are less distinct against the brown body-color than in young specimens; the head of the female is much narrower than the male, while the red tinge upon the same is never so brilliant as in the other sex. The complete color transformation takes about four years.



FIG. 19. BLUE-TAILED LIZARD, YOUNG AND ADULT

The female of this species deposits her eggs, to the number of about a dozen, under the bark of a decaying tree, and coils about the edge of the cluster in serpentine fashion until they hatch. Large specimens of the red-headed form measure eight inches in length. In the South the species grows much larger and is very abundant. The adult males are called "Scorpions."

*Range:* Southern Massachusetts to Florida; westward to Texas.

*Local distribution:* General in sunny openings of woods, but not common.



The Fence Swift, *Sceloporus undulatus* (Fig. 20), common everywhere in the southern United States, is very rare within a radius of fifty miles of New York City. In the pine forests of southern New Jersey this agile creature is particularly abundant, and may be seen darting with bewildering speed along fences and fallen trees.

Fence  
Swift.



FIG. 20. FENCE SWIFT

Unlike the Blue-tailed Lizard, so conspicuous on account of its shining scales, the Fence Swift presents a rough, lusterless surface. The scales are keeled and terminate in sharp, spine-like fashion. The body is rather broad, the head wide. In color this lizard is gray or brown with a series of V-shaped blotches on each side of the body; the underside is dark-gray or black with several large patches of blue. The latter patches vary in intensity according to conditions of temperature and the

activity of the reptile. Six inches is the average length of fully mature specimens.

*Range:* New Jersey to Florida.

*Local distribution:* Recorded from the Palisades of the Hudson River and Monmouth County, N. J.

# TURTLES.

Order *Chelonia*.

Of the twelve species of turtles, or chelonians, found locally, three are marine wanderers from warmer climes and of rare occurrence. The marine turtles may be immediately recognized by their peculiar paddle-like limbs which are frequently termed "flippers." The use of these members in the progress of a sea turtle through the water has been appropriately compared to the flight of a hawk or an eagle. Of the other species of chelonians, one is strictly terrestrial in habits, while eight species are semi-aquatic and frequent the neighborhood of ponds and marshes.

The upper shell of a turtle is technically known as the "carapace," the lower shell as the "plastron." These terms have been employed throughout the description of the species with a view of abbreviation.

## Key to the Turtles.

- a. LIMBS LONG AND PADDLE-LIKE (FLIPPERS) ..... **SEA TURTLES.**
  - aa. Carapace with seven heavy keels, running lengthwise.  
Uniform dark brown..... **Leather - back Turtle**  
(*Dermochelys coriacea*).
  - ab. Carapace smooth.  
Olive - brown; head very large; usually two nails on each flipper..... **Loggerhead Turtle**  
(*Thalassochelys caretta*).
  - Olive or brown, marbled with yellow; head of moderate size; usually one nail on each flipper..... **Green Turtle** (*Chelonia mydas*).

b. LIMBS AND FEET WELL DEVELOPED; FEET  
WEBBED.....**POND AND MARSH  
TURTLES.**

ba. Carapace smooth.

1. Plastron hinged to close against  
the carapace.

Dark brown; a yellow stripe  
on each side of the head....**Musk Turtle** (*Aromochelys odoratus*).

Dark brown; head speckled.**Mud Turtle** (*Kinosternon pennsylvanicum*).

2. Plastron rigid.

Black or olive above; lower  
edge of carapace brightly  
marked with red; plastron  
yellow.....**Painted Turtle** (*Chrysemys picta*).

Carapace black with numer-  
ous yellow spots; plastron  
black, blotched with yel-  
low.....**Spotted Turtle** (*Chelopus guttatus*).

Carapace black or brown, the  
shields showing lighter  
borders; head black; a  
brilliant yellow patch on  
each side behind the eye..**Muhlenberg's Turtle**  
(*Chelopus muhlenbergii*).

bb. Carapace showing raised, angular  
lobes.

Plates of carapace concen-  
trically ringed; light brown  
above, limbs, neck and  
fleshy parts salmon red..**Wood Turtle** (*Chelopus insculptus*).

Plates of carapace with nu-  
merous concentric rings;  
color, olive above, head

and limbs gray, profusely  
spotted with black.....**Diamond-Back Terra-  
pin** (*Malacoclemmys*  
*palustris*).

Tail long, partly covered  
with plates; head very  
large; color brown or  
olive.....**Snapping Turtle** (*Che-  
lydra serpentina*).

c. FEET CLUB-SHAPED, NOT WEBBED.....**TORTOISES.**

Carapace high; plastron  
hinged; color brown, ir-  
regularly marked with yel-  
low.....**Box Tortoise** (*Cistude*  
*carolina*).



FIG. 21. HEAD OF LEATHER-BACK TURTLE





FIG. 22. LEATHER-BACK TURTLE



FIG. 23. LEATHER-BACK TURTLE; ON ITS BACK

# DESCRIPTIVE LIST OF THE TURTLES.

The Leather-back Turtle, or Trunk Turtle, *Dermochelys coriacea* (Figs. 21, 22 and 23), is easily distinguished from the two other species of sea turtles occasionally taken off our coasts, by the heavy, ridge-like processes, seven in number, running lengthwise on the carapace. Instead of the horny plates usually present on turtles, the carapace and plastron of this species are covered with a leathery integument. The Leather-back Turtle attains a large size. In warmer waters specimens are occasionally captured which exceed seven feet in length. The general color is dark brown, although there is sometimes a sprinkling of yellow. Like the other sea turtles this species never comes to the shore, except for the purpose of depositing eggs. Its flesh is of no value for food purposes. The reptile feeds upon fishes, crustacea, mollusks and seaweeds.

*Range:* Tropical seas.

*Local distribution:* Occasionally off the Atlantic coast of the Middle Atlantic and New England States, where its presence is accidental.

The Loggerhead Turtle, *Thalassochelys caretta* (Figs. 24 and 25), might possibly be confounded with the Green Turtle, owing to a similarity of the shells of these species. Certain characters, however, make determination comparatively simple. The head of the Loggerhead is very large in proportion to the reptile's size; the flippers are generally provided with two nails, while the shell is dark brown, sometimes marked with a lighter brown. The colors of the Green Turtle are much lighter; the head of medium size; there is generally one nail on each flipper. Both of these species have shells covered with smooth shields. The flesh of the Loggerhead is little cared for. It does not deposit eggs in temperate regions. This species attains a length of six feet.

*Range:* Tropical and semi-tropical seas.

*Local distribution:* An accidental visitor off the Atlantic coast.



FIG. 24. LOGGERHEAD TURTLE

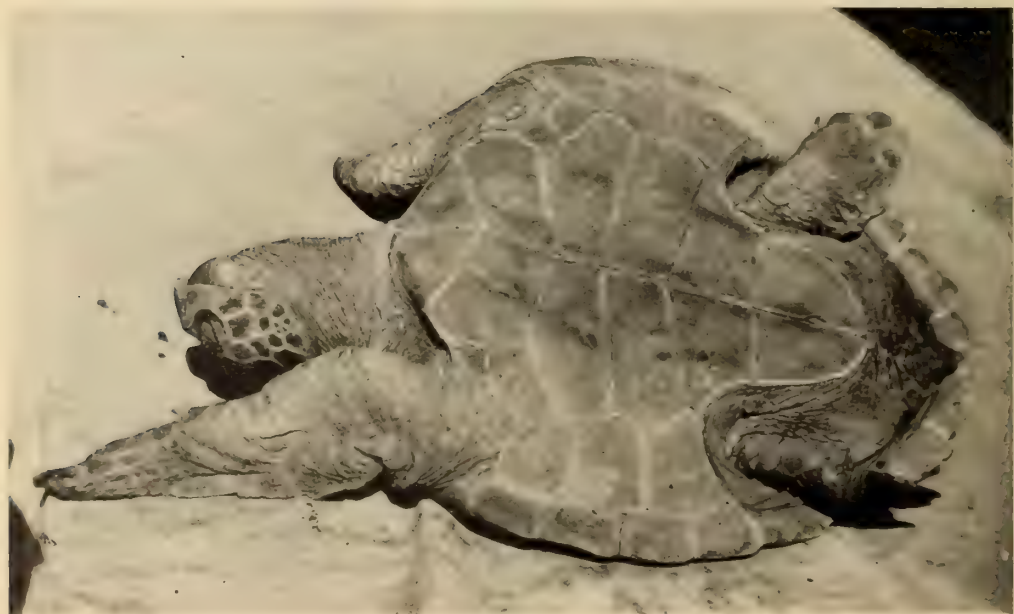


FIG. 25. LOGGERHEAD TURTLE ; ON ITS BACK





FIG. 26. GREEN TURTLE

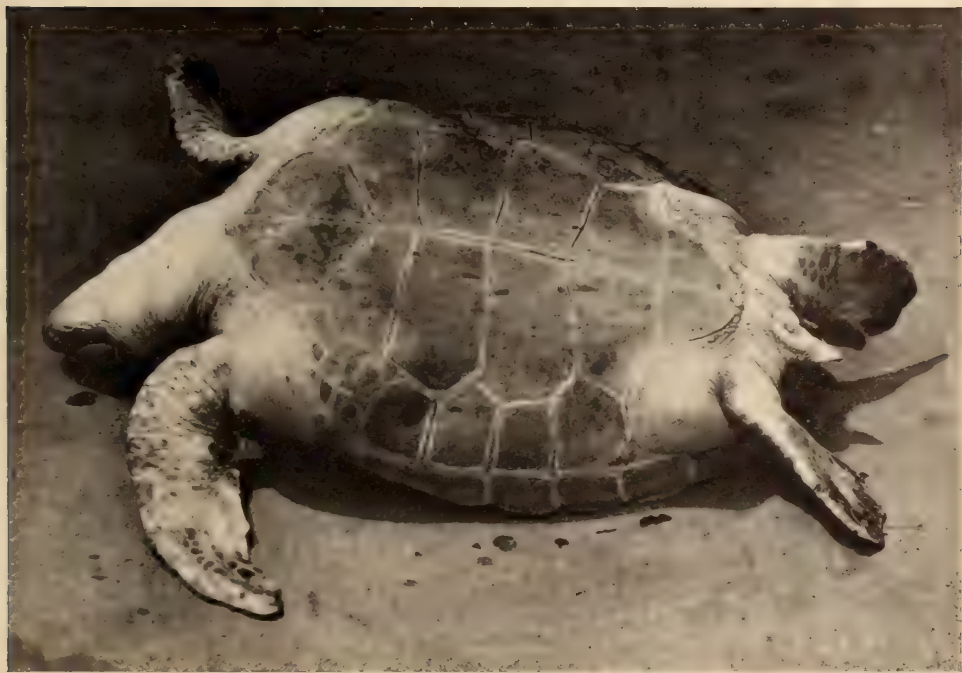


FIG. 27. GREEN TURTLE; ON ITS BACK

The Green Turtle, *Chelonia mydas* (Figs. 26, 27 and 28), is an attractive species, the coloration of the shell being a pale olive, marbled with yellow. The Green Turtle obtains its name from the distinctly green hue of its fat. Highly esteemed as an article of food, these turtles are commonly seen in the markets lying upon their backs, in which position they are helpless.<sup>1</sup> In tropical waters this species is alleged to attain a weight of a thousand pounds.

Green  
Turtle.

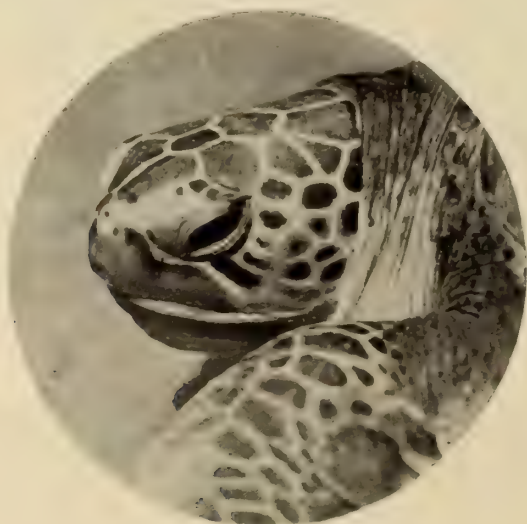


FIG. 28. GREEN TURTLE; HEAD

*Range:* Tropical and semi-tropical seas.

*Local distribution:* An accidental visitor off our northern seacoasts.

The Snapping Turtle, *Chelydra serpentina* (Figs. 29 and 30), represents the largest species of our local turtles, excepting the three already described. Its rough carapace of somber brown, with its keels and serrations, and the proportionately huge, sinister head combine to make this creature unique among our turtles. The tail is long and possesses a series of plates which form an alligator-like crest; the carapace is deeply serrated posteriorly. In proportion to

Snapping  
Turtle.

<sup>1</sup> The majority of the fresh-water turtles, however, when so placed, can readily roll over through the combined assistance of the head and limbs.



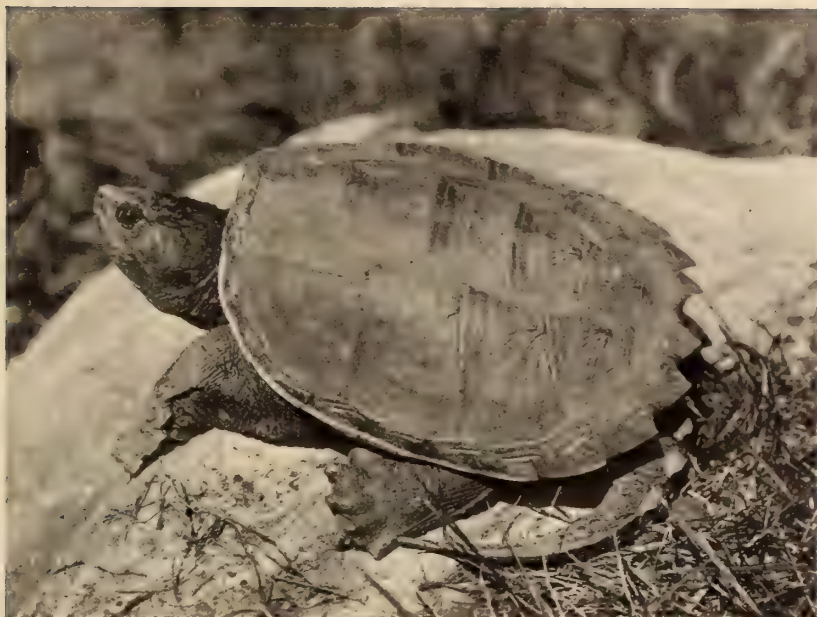


FIG. 29. SNAPPING TURTLE

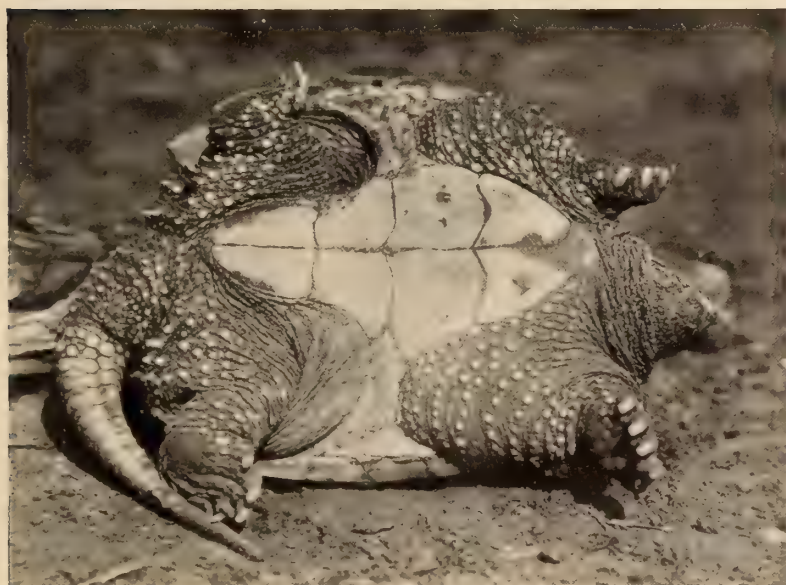


FIG. 30. SNAPPING TURTLE ; ON ITS BACK

the reptile's size the plastron is very small and provides little or no protection for the limbs in time of danger. In color the Snapping Turtle is dark brown, with no markings. Adult specimens attain a length of two feet and a weight of from thirty-five to forty pounds. The carapace of old specimens is often covered with moss.

Slow-running muddy streams and large ponds are the lurking places of these reptiles, which are exceedingly voracious. Lying partly hidden in the mud, they await the approach of fish or even young water fowl. Possessed of a pugnacious disposition, a large specimen might well be rated as dangerous. The hooked jaws are capable of inflicting deep wounds, and are, moreover, employed with energy when the reptile is annoyed. When of medium size, the species is said to be edible. The eggs are deposited in June, to the number of from two to four dozen; they are perfectly spherical and possess a hard shell.

*Range:* Canada and the United States east of the Rocky Mountains; southward to Ecuador.

*Local distribution:* General and abundant.

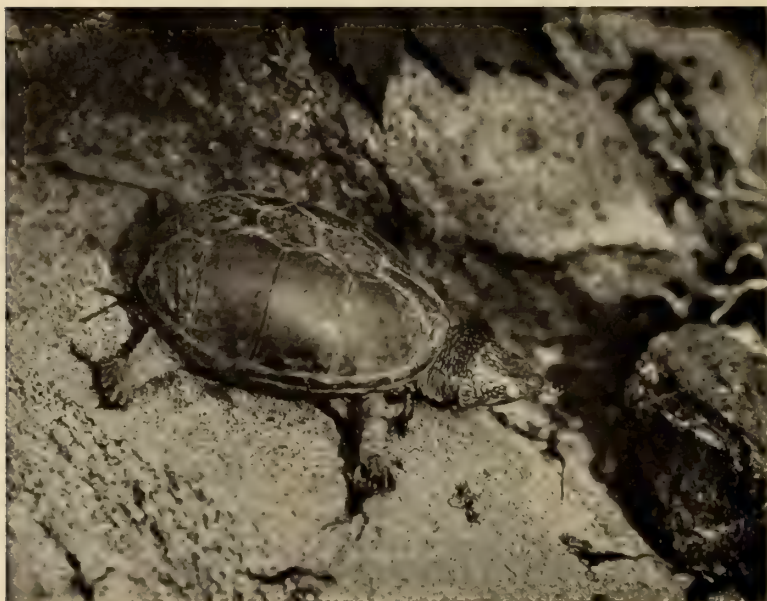


FIG. 31. MUD TURTLE

The Mud Turtle, *Kinosternon pennsylvanicum* (Figs. 31 and 32), is often confounded with the Musk Turtle (*Aromochelys odoratus*), which it resembles in shape and size. The principal differences between the two species are in the markings of the head and the width of the plastron.

**Mud  
Turtle.**

The head of the Musk Turtle shows on each side two distinct, yellowish stripes, beginning at the tip of the snout and running to the neck, and the plastron is very narrow and is much shorter than the carapace, affording little protection. The Mud Turtle, on the other hand, shows no stripes upon the head and neck; the head is irregularly speckled with green or yellow; the plastron is wide, is but a trifle shorter than the carapace, and can be closed to afford substantial protection. The average length of the Mud Turtle in this vicinity is about three and one-half inches when adult. It is not as common as the Musk Turtle.

*Range:* The eastern United States from New York to the Gulf of Mexico.

*Local distribution:* General in slow-running, muddy streams and ponds.

The Musk Turtle, *Aromochelys odoratus* (Figs. 33, 34 and 35), may be distinguished from the Mud Turtle, which it closely resembles, by the points given under the preceding caption.



FIG. 32. MUD TURTLE; ON ITS BACK





FIG. 33. MUSK TURTLE



FIG. 34. MUSK TURTLE

In some localities the Musk Turtle is very common, particularly in slow-running rivers with soft, muddy beds. When annoyed, it gives off a musky odor which is strong enough to be offensive. The carapace of an old specimen is usually so overgrown with moss as to be seen with difficulty when the animal is lying in the mud in shallow water, as is its habit. This species is frequently hooked in fresh-water fishing. In many ways the species resembles, in miniature, the Snapping Turtle. From three to four inches is the maximum size.

**Musk  
Turtle.**



FIG. 35. MUSK TURTLE; ON ITS BACK

*Range:* Eastern North America from Canada to the Gulf of Mexico.

*Local distribution:* General in slow-running streams and ponds. Occurs within the limits of New York City, and is very common in the Bronx River.

None among our turtles is better known, although possibly only by name, than the Diamond-back Turtle, or Terrapin, *Malacoclemmys palustris* (Figs. 36 and 37). The Diamond-shields of the carapace rise from the surface of the back shell in a series of rough, concentric rings; the row of shields down the back shows a broken keel which rises rather sharply in the center of each plate: this condition is especially

**Diamond-  
back  
Terrapin.**





FIG. 36. DIAMOND-BACK TURTLE (TERRAPIN)



FIG. 37. DIAMOND-BACK TURTLE; ON ITS BACK



FIG. 38. PAINTED TURTLE



FIG. 39. PAINTED TURTLE ; ON ITS BACK

prominent in young specimens and decreases with age and consequent wear of the shell. The color of the carapace is uniform green or olive, although the edges of the plates are sometimes of a slightly different shade. The general color of the limbs, head, neck and tail is pale gray, profusely spotted with black; the plastron is yellow, lined and spotted with gray.

The Diamond-back is the familiar market terrapin, and at certain times of the year sells as high as \$70 per dozen. It is becoming rare in the north. Large specimens will measure ten inches in length. This is the only species of local turtle (with the exception of the Sea Turtles) that frequents salt water.

*Range:* The Atlantic coast from New York to Florida.

*Local distribution:* Salt marshes in the vicinity of Long Island Sound, Staten Island and New Jersey.

The Painted Turtle, *Chrysemys picta* (Figs. 38 and 39), is one of the most common of the local species and is easily recognized.

**Painted Turtle.** The general color above is dark olive or black, with the margins of the shields of a paler shade. The margin of the under side of the carapace is black, with bright red markings; the plastron is yellow. Limbs, tail and neck, black, lined with red; head, lined with yellow. The shell of this species is flat and smooth; about five inches is the normal length.

Abundant in the vicinity of ponds, streams and marshes, these turtles may be often seen on floating logs or the like, from which they plunge quickly if alarmed. The food consists principally of small fishes and insects. Captive specimens thrive on raw chopped meat or fish.

*Range:* North America from New Brunswick to Georgia.

*Local distribution:* General and abundant.

Muhlenberg's Turtle, *Chelopus muhlenbergii* (Figs. 40 and 41), which somewhat resembles the Spotted Turtle (*Chelopus guttatus*), may be easily distinguished from the latter species by the brilliant orange spot on each side of the head. **Muhlenberg's Turtle.** The carapace is dark brown or black, sometimes marbled with light brown; the shields often show lighter margins. The shell is black beneath, blotched with yellow. The spot on each side of the head is quite characteristic. It is

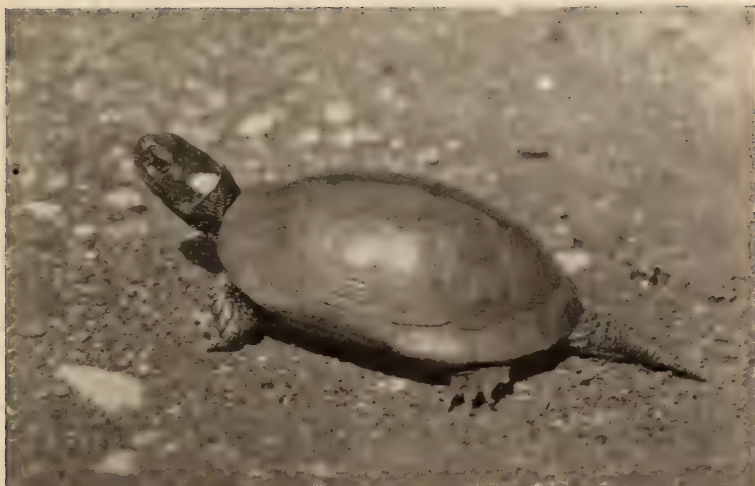


FIG. 40. MUHLENBERG'S TURTLE



FIG. 41. MUHLENBERG'S TURTLE





FIG. 42. WOOD TURTLE



FIG. 43. WOOD TURTLE ; ON ITS BACK



situated a little behind the eye and slightly above the region of the ear. The species is very rare in this vicinity. An adult specimen will measure four inches in length.

*Range:* Southern New York, New Jersey and eastern Pennsylvania.

*Local distribution:* Recorded from Staten Island and the Palisades of the Hudson River. Frequents shallow streams and swamps.

The Wood Turtle, *Chelopus insculptus* (Figs. 42 and 43), sometimes called the Wood Tortoise, is a species quite terrestrial in habits. The general aspect of the carapace is rough, the plates being raised in concentric rings, and there is a distinct keel down the back. The color is brownish above, irregularly and rather indistinctly marked with yellow or light brown; the plastron is reddish yellow with a blotch of black on each plate; limbs, neck and fleshy parts tinged with salmon red. The head is uniform brown.

**Wood  
Turtle.**

Although never found far from the vicinity of water, this species is not a water turtle, but prefers to roam about on swampy ground. In habits it resembles the Box Tortoise (*Cistudo carolina*), feeding largely upon vegetable matter. The Wood Turtle attains fairly large dimensions, the length of an adult specimen being eight inches.

*Range:* The northeastern United States.

*Local distribution:* General in swampy districts, but not common.

The Spotted Turtle, *Chelopus guttatus* (Fig. 44), rivals the Painted Turtle in being the most common of the local chelonians. The shell is smooth and black above with numerous round, yellow spots which vary in number on different individuals. The plastron is yellow, blotched with black. The average length of an adult specimen is four inches.

**Spotted  
Turtle.**

*Range:* Maine to South Carolina; westward to Ohio.

*Local distribution:* General and abundant.

The Box Tortoise, *Cistudo carolina* (Figs. 45, 46 and 47), is a strictly terrestrial species. The plastron is provided with a remarkable, practical double hinge, which is employed for pro-



FIG. 44. SPOTTED TURTLE



FIG. 45. BOX TORTOISE

tection in time of danger. When the reptile is annoyed, the front and rear sections of the plastron are pulled upwards towards the carapace, and so closely do the two shells come together that it is difficult to insert even a fine wisp of straw at any point between them.

**Box  
Tortoise.**

The Box Tortoise lives to great age, as is shown by the fact that specimens have been found upon the shells of which were names and dates that had been carved there sixty and seventy years before. Such tortoises were found near the fields in which

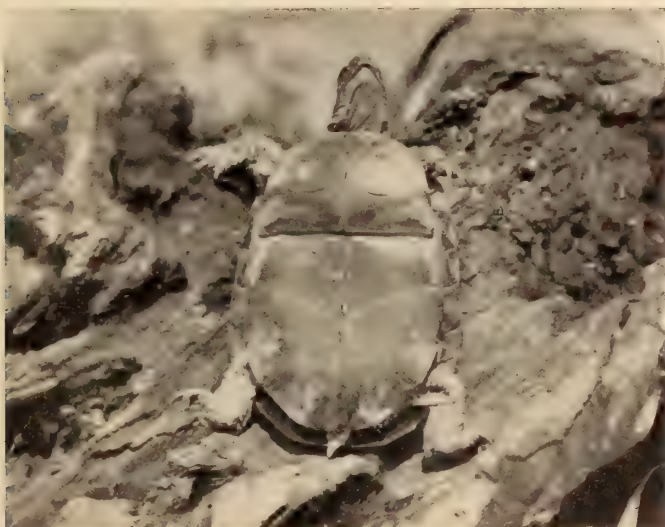


FIG. 46. BOX TORTOISE ; ON ITS BACK

they lived when marked, hence the probability is that the animal is not a great traveler. During very dry seasons the Box Tortoise has been known to abandon the surface of the ground and burrow deeply into moist earth or mud.

Extremely variable in coloration, although the general colors are brown or black, irregularly marked with yellow, the species is more readily recognized by its form. The carapace is arched and high; the limbs are club-shaped and fitted for a terrestrial existence. Male specimens may be recognized by a distinct concave area on the rear section of the plastron and by their

red eyes. The Box Tortoise is largely herbivorous. It is very fond of berries. The length of an adult specimen is about six inches.

*Range:* The eastern United States.

*Local distribution:* General and common.

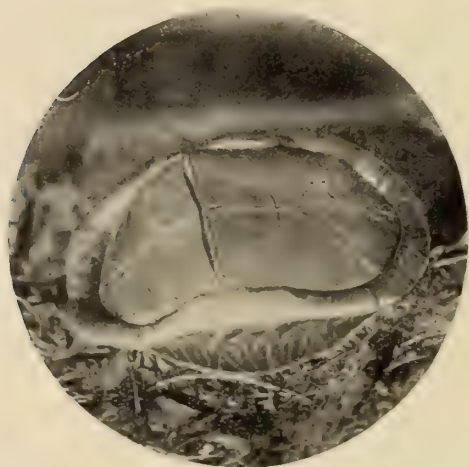


FIG. 47. BOX TORTOISE WITH CLOSED PLASTRON







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AMERICAN MUSEUM OF NATURAL HISTORY

# The Batrachians of the Vicinity of New York City



By Raymond L. Ditmars

Curator of Reptiles, New York Zoological Park

With illustrations from photographs from life by Herbert Lang, American Museum of Natural History

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL

VOL. V, No. 4, OCTOBER, 1905

Guide Leaflet No. 20

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FIG. 1. BULL FROG. NEARLY NATURAL SIZE  
From specimen in New York Zoological Park

The  
Batrachians of the Vicinity  
of  
New York City

With Reference to the Collection in the  
American Museum of Natural History

By

RAYMOND L. DITMARS

CURATOR OF REPTILES, NEW YORK ZOÖLOGICAL PARK

With Illustrations from Photographs taken from Life

BY

HERBERT LANG

AMERICAN MUSEUM OF NATURAL HISTORY

**GUIDE LEAFLET No. 20.**

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## PREFATORY NOTE

The Museum gratefully acknowledges the coöperation of the New York Zoölogical Society in the preparation of the Guide. The author is Mr. Raymond L. Ditmars, Curator of Reptiles in the New York Zoölogical Park, Bronx Park, who also prepared the leaflet upon the local reptiles which was issued with the preceding number of the JOURNAL. Through Director W. T. Hornaday the abundant living material of the Zoölogical Park was placed at the disposition of the Museum for the purpose of making photographs for the illustrations, and through Director C. H. Townsend similar courtesies were extended at the New York Aquarium, Battery Park. The source of the illustrations is indicated under each figure.

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The collection illustrating the local batrachians may be found at present in the Synoptic Hall, No. 107 of the ground floor of the Museum Building.

# THE BATRACHIANS OF THE VICINITY OF NEW YORK CITY.<sup>1</sup>

BY RAYMOND L. DITMARS,

Curator of Reptiles, New York Zoölogical Park.

---

With Illustrations from Photographs Taken from Life

BY HERBERT LANG,

American Museum of Natural History.

## INTRODUCTION.



FOLLOWING the reptiles in zoölogical classification come the batrachians, creatures which may be said to constitute a connecting link between the reptiles and the fishes. Unlike the former, the great majority of batrachians begin life as strictly aquatic, fish-like forms, provided with gills, which with many species are elaborately developed in the shape of external, fringed processes. From this aquatic form, with gills (the tadpole or larval stage), the average batrachian ultimately matures into a creature constituted to breathe atmospheric air.

Swamps and bogs and the borders of streams and ponds are usually the homes of the batrachians, which thrive in such damp situations. Some species, like the toad, are quite terrestrial, and many are subterranean, but with few exceptions they frequent the immediate vicinity of water or damp and shaded places. There are species that remain aquatic throughout life, like the Mud Puppy (*Necturus*) and the Hellbender (*Cryptobranchus*), both North American species. In the Old World is found the *Proteus*, a blind and translucent species, that passes its entire existence in underground rivers or in the dark lakes of European caverns.

<sup>1</sup> Reprinted from *The American Museum Journal*, Vol. V, pp. 161-206, Oct., 1905.

With but few exceptions the mature batrachians differ from the reptiles in the total absence of scales. Their naked, usually slimy skin at once defines them to the novice. The few scaled species indicate their scalation only upon close examination, and beneath the shining skin may be discerned a fine dermal texture. No species among the local batrachians possesses scales.

In our local fauna, two orders of the Batrachia are represented. These are the *Urodela*, comprising Salamanders and Newts, and the *Salientia*, or Tailless Batrachians (the Toads and Frogs).

### SALAMANDERS.

#### Order *Urodela*.

The salamanders and the newts may be easily recognized by their lizard-like form, but even the novice may at once distinguish them from true lizards by their moist or slimy, naked skin, totally devoid of scales. Many of the semi-aquatic species, however, are actually known in the regions they inhabit as water "lizards."

The majority of the local species begin life, like the frogs and toads, as tadpoles, hatching from opaque eggs which are deposited in streams and ponds. Unlike the frog larva however, the tadpole of the salamander retains throughout the larval state external gills, arranged in three tufts on each side of the head. These gills are delicately fringed and enable the young creature to lead a fish-like existence. The presence of these organs enables the observer to distinguish at a glance the larvæ of the salamanders and newts from those of the frogs and toads. Apart from the gills, however, the salamander tadpoles differ from the tailless batrachians in the development of the limbs. The front limbs are the first to appear, an external character quite reversed among the frog larvæ. Though the development with the latter is the same as with the salamanders, the growth of the front limbs goes on under cover of the operculum, while the hind limbs are attaining external development. When the front limbs attain their growth, they push their way suddenly through the folds of the operculum and into view.

A few of the local salamanders, represented by the genera

*Plethodon* and *Hemidactylium*, undergo their metamorphosis in damp places under stones or logs in the woods. The young of these possess branching gills when hatched, but the gills are absorbed within a few days.

In the vivarium, many of the salamanders may be kept for observation by providing them with some three inches of damp *Sphagnum* moss, over which have been placed strips of old bark. The moss should be kept very damp. Ant larvæ, the grubs of the smaller wood-boring beetles and small earthworms serve as food.

If these creatures were provided with scales like the reptiles, the making of a popular key for identification would be simple. There is, however, among most salamanders a peculiar uniformity of external surface and general structure. Technical divisions of the *Urodela* are founded upon the arrangement of the teeth, the anatomical structure of the tongue, the shape of the tail and the development of the toes. In the preparation of the following key, however, the writer has relied upon the few characters that appeal to an observer not versed in technical terms. The characters employed pertain to variation of *outline*, where such exists, *size* and *color-pattern*. In our local fauna four families, comprising twelve species and two varieties, are represented. These are, the AMBLYSTOMIDÆ, represented by *Amblystoma opacum*, *A. tigrinum*, *A. punctatum*; the PLETHODONTIDÆ, *Plethodon glutinosus*, *P. cinereus*, *P. cinereus erythronotus*, *Hemidactylium scutatum*, *Spelerpes ruber*, *S. bilineatus*, *S. longicauda*; the DESMOGNATHIDÆ, *Desmognathus fusca*, *D. ocropheæ*; the PLEURODELIDÆ, *Diemyctylus viridescens*, *D. viridescens miniatus*.

### *Key to the Salamanders.*

#### a. FORM STOUT, SIZE LARGE.

##### i. Tail flattened towards the tip.

Black, marbled with grayish

white blotches..... **Marbled Salamander** (*Amblystoma opacum*).

Black, marbled with yellow,

the yellow predominating... **Tiger Salamander** (*Amblystoma tigrinum*).

Black, two rows of yellow

spots, black predominating. **Spotted Salamander** (*Amblystoma punctatum*).

## b. BODY CYLINDRICAL, ELONGATED.

## 1. Tail rounded.

Size moderate; black, with  
silvery spots. . . . .

**Slimy Salamander** (*Plethodon glutinosus*).

Size very small; brown, with  
minute white dots. . . . .

**Gray Salamander** (*Plethodon cinereus*).

Size very small; dark gray, a  
reddish band on back. . . . .

**Red-backed Salamander** (*Plethodon cinereus erythronotus*).

## 2. Tail bluntly oval.

Size small; snout very blunt;  
brown, paler on back. . . . .

**Four-toed Salamander** (*Hemidactylium scutatum*).

## 3. Tail flattened towards the tip.

Size moderate; bright red,  
spotted with black. . . . .

**Red Salamander** (*Spelerpes ruber*).

Size small; yellow band on  
back, dark bands on the  
sides. . . . .

**Two-lined Salamander** (*Spelerpes bilineatus*).

Size larger; yellow, sides with  
many black spots and a  
median dorsal series thereof;  
tail keeled above, very long.

**Long-tailed, or Cave Salamander** (*Spelerpes longicauda*).

Size moderate; gray, minutely  
dotted with white; greater  
length of tail flat. . . . .

**Dusky Salamander** (*Desmognathus fusca*).

Size moderate; brown, lighter  
on head; basal half of tail  
rounded. . . . .

**Mountain Salamander** (*Desmognathus ochrophæa*).

## c. OUTLINES WELL PROPORTIONED; SIZE SMALL.

## 1. Tail flat from base to tip.

Skin smooth; tail fin-like;  
olive above, yellow beneath,  
a row of red spots on side;  
aquatic. . . . .

**Water Newt** (*Diemyctylus viridescens*).

Skin rough; tail thicker; red-  
dish brown to vermilion;  
terrestrial. . . . .

**Red Eft; Mountain "Lizard"** (*Diemyctylus viridescens miniatus*).



DESCRIPTIVE LIST OF THE SALAMANDERS.



FIG. 2. THE MARBLED SALAMANDER  
From specimen in New York Aquarium

The Marbled Salamander, *Amblystoma opacum* Gravenhorst (Fig. 2), is of moderate size and stout form, with flattened tail, which is thick at the base. General color slaty-black, with large elongated spots or blotches of grayish-white on the back and head. Some of the spots run together, producing a marbled appearance, a character which occurs on the back of many specimens. The spots are regularly disposed as half-rings on the upper surface of the tail, producing a banded appearance. Beneath, this species is a uniform bluish-black. It may be distinguished from the other local representatives of the genus by its grayish-white markings, the other species possessing yellowish markings. Total length,  $4\frac{3}{4}$  inches; length of tail, 2 inches.

*Range:* The eastern and central portions of North America.

*Local Distribution:* General in this vicinity, but not common.

The larvæ of the marbled Salamander may be found in shallow ponds in the openings of woods. They grow rapidly and leave the water late in June or early in July. While developing, they present a dull, grayish appearance, thickly dotted with white, which pattern gives way to the markings of the adult a short time prior to their leaving the water. In the adult form this salamander selects dry situations, and may be found under stones in sandy, or dry and hilly country, where it burrows to some depth.



FIG. 3. THE SPOTTED SALAMANDER  
From specimen in New York Zoological Park

The Spotted Salamander, *Amblystoma punctatum* Linn. (Fig. 3), is a large form with stout body and broad head. The tail is rounded at the base, but bluntly compressed towards the end. Black above, with a row of round brilliant-yellow spots on each side. This row extends to the tip of the tail and is a ready means of identification. There are several of these spots, too, on the upper surface of each limb. The lower sides are slaty-gray, sprinkled with small, bluish-white spots. In form the Spotted Salamander slightly resembles the Tiger Salamander, but may be distinguished therefrom by the

regularity of its color pattern. Total length,  $7\frac{1}{2}$  inches; length of tail,  $3\frac{3}{4}$  inches; width of head,  $\frac{3}{4}$  inch.

*Range:* Eastern and central North America.

*Local Distribution:* Sparing, in damp woods.

The eggs are deposited early in the spring in ponds and small streams. They resemble the spawn of frogs. The adult may be found under logs and stones in thinly timbered sections. Like the other species of this genus, this salamander will live for years in the vivarium.



FIG. 4. THE TIGER SALAMANDER  
From specimen in New York Zoölogical Park

The Tiger Salamander, *Amblystoma tigrinum* Green (Fig. 4), is a large species with stout body, flat head and compressed tail. Ground color above, dark brown or gray (sometimes black), thickly covered with large, irregular, yellowish blotches. The blotches predominate and impart a marbled appearance to the animal. On the lower portions of the sides the yellow is present in the form of round spots, or scattered blotches, and the ground color is lighter. The chin is thickly marked with yellow, but little of the color is apparent on the abdomen, which is gray. The intensity of the markings depends much upon the age of the individual. Very old specimens show a faint pattern and in some lights appear to be of a dull, uniform

Tiger  
Salamander.

brown. This is the largest of our salamanders. Although in form resembling the Spotted Salamander, its blotched appearance makes identification easy. The limbs are large and well developed. A mature specimen from New Jersey shows a total length of  $8\frac{1}{2}$  inches; the tail is  $3\frac{3}{4}$  inches long, and the head  $\frac{3}{4}$  inch wide. The species is said to attain a length of eleven inches.

*Range:* The entire United States and southern Canada; northern and central Mexico.

*Local Distribution:* Rare, but found occasionally on Long Island and in New Jersey.

Although one of the rarest of the local batrachians, the Tiger Salamander is our most interesting species. The metamorphosis from the larval to the adult form depends largely upon light and temperature, and is strongly influenced by surrounding conditions. In the western and southwestern portions of the United States it is abundant, and throughout those areas, for many years, its larval or tadpole stage was thought to constitute a distinct species, the Axolotl. In permanent lakes of some depth, where the water remains moderately cold and there is abundance of food suitable for the larval form, this creature evinces an interesting persistency in retaining the branching gills (branchiæ) and continues its aquatic existence for indefinite periods even attaining the size of the terrestrial form.

More remarkable, however, than tardy metamorphosis is the fact that during this evidently larval state these creatures breed and deposit eggs. In this aquatic form the species has had several different names. In the case of an evaporating pool, slowly drying away under the summer sun, the larva finds an opportunity along the shallow borders frequently to employ its nostrils at the surface of the water, with the result that the gills become degenerated and transformation is hastened.

Adult specimens secrete themselves in burrows, not far from the vicinity of water, although they may be occasionally found hiding under decaying logs, in very moist situations. They prey upon insects and worms, and they even attack larger creatures, when within reach. A specimen in the writer's collection devoured several very young field mice. Hiding by day, they prowl during the hours of darkness or during rains.



The Four-toed Salamander, *Hemidactylium scutatum* Tschudi (Fig. 5), is small, with cylindrical body and very bluntly oval tail. Color above, deep reddish brown; about the head, especially on the snout, there is a lighter shade, approaching bronze. Close examination of most specimens will reveal the presence of numerous dark spots on the upper surfaces. The sides of the body present a mottled ap-

Four-toed  
Salamander.



FIG. 5. THE FOUR-TOED SALAMANDER  
From specimen in Am. Mus. Nat. Hist.

pearance, and the ground color is much lighter than on the back. The entire under surface is bluish-white, with a few, irregularly placed dark spots, presenting a strong contrast with the principal color.

This small species somewhat approaches the Gray Salamander in appearance, but may be distinguished therefrom by its very blunt snout and proportionately shorter tail. The back and the sides are strongly marked with furrows, a feature in which the species is quite unique. The limbs are small and weak. There are but four toes on the hind foot. Total length, 3 inches; length of tail,  $1\frac{1}{2}$  inches.



*Range:* The entire eastern portion of the United States.

*Local Distribution:* Mostly along the Palisades of the Hudson River.

The Four-toed Salamander, rather a rare species in this vicinity, is generally found in scattered companies. It is strictly terrestrial, and inhabits timbered regions, where it hides under logs and stones.

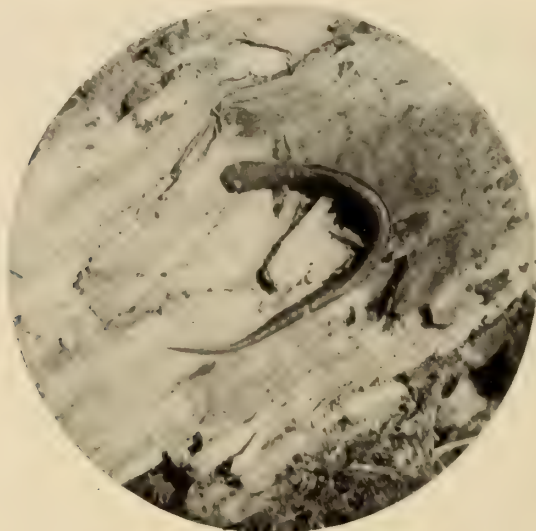


FIG. 6. THE GRAY SALAMANDER  
From specimen in New York Zoölogical Park

The Gray Salamander, *Plethodon cinereus* Green (Fig. 6), is a small form, very slender and worm-like; tail round and long. Color above, dark brown, grayish or black, sprinkled with minute silvery spots. Sides of the body lighter and speckled with dark gray. Abdomen pale gray, marbled with a darker shade. Total length, 3 inches. Diameter of body,  $\frac{3}{16}$  of an inch.

*Range:* Southern Canada and the United States generally, east of the Mississippi.

*Local Distribution:* Particularly abundant on the Palisades of the Hudson River.

This very common little salamander is strictly terrestrial.

It may be found in numbers, hiding under flat stones and logs in damp woods. Although provided with very small and slender limbs, it displays remarkable agility when disturbed, either wriggling its way among fallen leaves, or progressing over them by a series of jumps caused by doubling its worm-like body into a series of lateral undulations and suddenly straightening itself.

The eggs are deposited under damp and decaying logs, in moss or under stones. When the minute larvæ emerge, they possess external gills, but these are absorbed within a few days'



FIG. 7. THE RED-BACKED SALAMANDER  
From specimen in New York Zoölogical Park

time. The species is never aquatic at any stage of its life. It is easily distinguished from the other salamanders by its extremely slender body and perfectly round tail.

The Red-backed Salamander *Plethodon cinereus erythronotus* Green (Fig. 7), in size and dimensions is like the preceding form. Grayish on the sides with a bright reddish band on the back.

This band is wide, covering the greater portion of the back and extending towards the end of the tail, where it becomes obscure. The lower portions of the sides present a

Red-backed  
Salamander.

thickly dotted appearance; the abdomen is grayish, marbled with darker gray. On some specimens the bright band on the back is sprinkled with small gray dots, but these are so minute that they scarcely produce a dull effect upon the color. On occasional specimens these dots fuse together, forming a dull line down the back, and imparting a resemblance to the markings of many specimens of the Two-lined Salamander. From the latter, however, the present species is at once distinguished by its round tail.

*Range:* The United States east of the Mississippi and southern Canada.



FIG. 8. THE SLIMY SALAMANDER  
From specimen in New York Aquarium

*Local Distribution:* Generally abundant in damp woods.

This variety is commonly found with the typical form, and occasionally under the same logs and stones with the Slimy Salamander.

The Slimy Salamander, *Plethodon glutinosus* Green (Fig. 8), is of moderate size and rather slender, cylindrical form. The tail is round. Black above, thickly covered with irregular greenish-white, or lichen-gray spots, these often appearing like patches of silvery dust. Different specimens show great variation in the size of the patches, some being blotched with the light color, while others might be said to

Slimy  
Salamander.

be finely speckled therewith. Lead color beneath, on which dull surface many specimens show numerous white dots. This species somewhat resembles the Marbled Salamander, but may be distinguished therefrom by its round tail and more numerous spots. It is, moreover, a more slender creature. The neck is much narrower than the head, causing the latter to look broad and flat, as in the larger salamanders (*Amblystoma*). Total length, 5 inches; length of tail,  $2\frac{1}{2}$  inches.

*Range:* From Canada to Florida and westward to Texas.

*Local Distribution:* General and common. It is particularly abundant on the New Jersey side of the Hudson River, along the Palisades.

When handled, this salamander exudes through the skin a whitish mucus that adheres persistently, hence the technical name, *glutinosus*, and the common one, Slimy Salamander. It is a common species, preferring hilly or mountainous districts, where it leads an entirely terrestrial life, hiding under stones and logs in thickly timbered places, whence it issues at night or in rainy weather.

The Two-lined, or Yellow-backed, Salamander, *Spelerpes bilineatus* Green (Fig. 9), is a small, slender form, with flat tail. Yellowish on the back, which color is bordered on each side with a band of dark gray, brown or black. These bands start from behind the eye and extend down the tail. Beneath the bands the color is pale yellow, profusely sprinkled with dark spots. The broad, yellowish band, covering the back is often spotted with dark gray or brown, and on some specimens the spots run together down the back forming a narrow, dark line. The entire under surface is bright and immaculate yellow. The body is cylindrical; the tail decidedly compressed. Total length,  $3\frac{3}{8}$  inches; length of tail,  $1\frac{7}{8}$  inches; diameter of body,  $\frac{1}{4}$  inch.

Two-lined,  
or Yellow-  
backed,  
Salamander.

*Distribution:* General, very abundant in the beds of rocky brooks.

*Range:* From Maine to Florida, and westward to the Missouri River.

The Two-lined Salamander is an extremely active species. It



is usually found hiding under flat stones in the beds of brooks, not actually under water, but where the soil is thoroughly saturated with moisture. When disturbed in its hiding-places, it does not entirely depend upon its diminutive limbs for escaping from danger, but makes surprisingly rapid progress by doubling its body into a series of lateral undulations and suddenly straightening it. The result is a number of bewildering jumps. This performance is varied with a snake-like wriggling. Thus, with a combination of agile motions, the little animal makes like a flash



FIG. 9. THE TWO-LINED OR YELLOW-BACKED SALAMANDER  
From specimen in New York Zoological Park

for the water and secretes itself among the stones. It is seldom seen except in the immediate vicinity of water, and the larvæ attain nearly the size of the adult before they begin an air-breathing existence.

The Long-tailed, or Cave, Salamander, *Spelerpes longicauda* Green (Fig. 10), resembles in form the Two-lined Salamander, but is a larger species and has a proportionately longer tail. The tail is much compressed and considerably longer than the body. The back is rich yellow, the sides paler. Scattered over the entire upper surface are coarse, black dots, which, on the sides of the tail

Long-tailed,  
or Cave,  
Salamander.



usually fuse into a series of upright bands. The abdomen is immaculate yellow. Total length,  $4\frac{3}{4}$  inches; length of tail,  $2\frac{7}{8}$  inches.

*Range:* The Central States, and inland portions of the Atlantic States.

*Local Distribution:* Mr. W. D. W. Miller has captured specimens near Plainfield, New Jersey. The writer has not taken it within the limits embraced by this work, but has found it abundant in Pennsylvania.



FIG. 10. THE LONG-TAILED, OR CAVE, SALAMANDER  
From specimen in Am. Mus. Nat. Hist.

This vividly marked species is at times found at a considerable distance from water, though always in damp situations—in caves or among the fissures of moss-covered rocks. The writer took large numbers of specimens along a mountain stream, at the Delaware Water Gap, Pennsylvania. They were hiding under flat stones in the bed of a nearly dry stream. Their rich coloration was in strong contrast to the damp sand. About a dozen of these specimens lived for a period of more than two years in damp, *sphagnum* moss, placed in an vivarium. During

this period they were supplied with ant-larvæ and white ants, or termites. During the day they always remained hidden, but at night they were frequently observed crawling about the surface of the moss.

The Red Salamander, *Spelerpes ruber* Daudin (Fig. 11), is of moderate size. Its form is cylindrical, — slender when young, becoming stout with an increase in length. Limbs small; tail rounded at base and becoming flattened towards the tip. Rich red or salmon color above, profusely sprinkled with small black spots; paler beneath.



FIG. 11. THE RED SALAMANDER  
From specimen in New York Zoölogical Park

Young specimens are frequently of a bright coral-red and not distinctly spotted. Those of medium size are darker red, with intensely black spots, while old specimens are often brownish and spotted with gray. Total length of fully adult specimen,  $5\frac{1}{2}$  inches; length of tail,  $2\frac{1}{2}$  inches; diameter of body,  $\frac{1}{2}$  inch.

*Range:* Canada to the Gulf of Mexico and westward to the Mississippi River.

*Local Distribution:* Moderately abundant in the Orange Mountains of New Jersey.

The eggs are deposited early in the spring in the deeper pools of brooks; the adults are semi-aquatic, living in the beds of clear and cold brooks under flat stones or in immediate proximity to the water, into which they quickly make their way when disturbed. They may be sometimes found hiding under the luxuriant moss that covers rocks adjacent to mountain streams, where their brilliant color is in vivid contrast to their surroundings.



FIG. 12. THE MOUNTAIN SALAMANDER  
From specimen in New York Zoölogical Park

The Mountain Salamander, *Desmognathus ochrophaea* Cope (Fig. 12), is of moderate size. Body cylindrical; tail rounded for the greater part of its length, flattened near the tip and tapering to a long, sharp point. A wide band of brown extends down the back from behind the head to the base of the tail, where it narrows and becomes indistinct towards the tip. Beneath the brown band the sides are dark gray. From the eye to the angle of the mouth there is a band of light color. The abdomen is dirty white, and generally sprinkled with pure white dots.

Mountain  
Salamander.

On occasional specimens the back is sprinkled with a line of black dots, giving the species a very similar pattern to the Two-

lined Salamander, which it also resembles in outlines. The adult Mountain Salamander may be recognized, however, by its rounded tail. Young specimens strongly resemble the Red-backed Salamander, even to the rounded tail. The following characters should be considered in separating them:

<i>Desmognathus ocrophea</i> . <sup>1</sup>	<i>Plethodon cinereus erythronotus</i> .
Form moderately slender.	Form very slender.
Stripe down the back brownish.	Stripe down the back reddish.
A light band from eye to angle of mouth.	No band from eye to angle of mouth.

Total length,  $3\frac{1}{2}$  inches; length of tail,  $1\frac{5}{8}$  inches; diameter of body,  $\frac{5}{16}$  inch.

*Range:* Common in the Adirondacks and the mountains of northern Pennsylvania, whence it extends southward into the mountain chains of Virginia and North Carolina.

*Local Distribution:* Very rare, and the species may possibly not occur within the limits given. A single specimen has been taken at Greenwood Lake, N. J.<sup>2</sup> It has also been found in Allegany County, N. Y. It may occur in the Orange Mountains of New Jersey.

In habits it appears to be quite terrestrial, living under decaying logs or burrowing its way under their bark.

The Dusky Salamander, *Desmognathus fusca* Rafinesque (Fig. 13), is of medium size. The body is cylindrical and moderately slender; tail flat. Color above dark brown or gray, with an obscure, reddish brown tinge on the back. The reddish brown tone is usually distinct on the tail, where it is paler in hue. Numerous black spots show through the brown of the back, which is often bordered with a tinge approaching pink or flesh color, the pink also showing on the tail. Outside this pinkish shade are numerous minute white dots arranged in thick clusters on the sides of the body. The skin of the abdomen is light and translucent and finely marbled with gray. Very old specimens are generally so dark as to

<sup>1</sup> This species is of doubtful or very rare occurrence in this vicinity.

<sup>2</sup> Taken by Eugene Smith, of Hoboken, N. J.



appear almost uniform black above and show no traces of markings except on the sides and abdomen. The head is about the same width as the body. The front pair of limbs is feeble; the hind pair, larger and stronger. Total length,  $4\frac{3}{4}$  inches; length of tail,  $2\frac{1}{4}$  inches; diameter of body,  $\frac{3}{8}$  inch.

*Range:* Eastern North America.

*Local Distribution:* Abundant in the vicinity of small streams.

This is the most abundant of our salamanders, but it is not



FIG. 13. THE DUSKY SALAMANDER  
From specimen in New York Zoölogical Park

found except in the immediate vicinity of water. It is common in all situations where flat stones, dead leaves or similar objects not actually in the water, but in damp or muddy places in the beds of pools, offer concealment. When discovered in its lairs it runs and wriggles with bewildering agility, often taking to shallow water and secreting itself in the mud in order to escape. According to Cope, the eggs of this species are connected by an albuminous thread, which contracts and hardens after deposition. One of the sexes protects this string of eggs by twisting it about the body and remaining in concealment. The exact duration of the guard over the progeny is not definitely known. The young



salamanders emerge from the eggs with traces of external gills, which are soon absorbed.

The Water Newt, *Diemyctylus viridescens* Rafinesque (Fig. 14), is of medium size. The body is rather stout; the tail very flat and fin-like. Dark olive or green above, on which are scattered numerous small black dots; on each side of the back is a row of small round spots of brilliant vermilion or brick red and bordered with narrow rings of black. The abdomen and lower sides of the body are pale yellow, which

**Water  
Newt.**



FIG. 14. THE WATER NEWT  
From specimen in Am. Mus. Nat. Hist.

meets in abrupt contrast the olive of the upper surface; this pale color is thickly covered with small black dots. On the head the line of meeting of the dark and light colors is slightly below the center of the eye.

The tail is very thin and at all times shows traces of fin-like edges, this character being particularly noticeable with the males during the autumn and the spring. Compared with the size of the body the limbs are large and well developed. Male specimens may be distinguished from the females by the large and stocky appearance of the hind limb, the lower joint of which is flattened and very wide, and in appearance quite out of

proportion to the front limb. In female specimens the front and hind limbs are of nearly equal size. During the autumn the males acquire a peculiar series of hard ridges along the inner surface of the hind limbs. This growth is more pronounced during the breeding season when it is clearly discernible as a raised, black process of skin, with a rough surface like the angular edge of a file. Total length,  $3\frac{3}{8}$  inches; length of tail,  $2\frac{1}{4}$  inches.

*Range:* Eastern United States and southern Canada.

*Local Distribution:* General, in ponds and lakes.

In this immediate vicinity, the Water Newt is a strictly aquatic creature, unless, on account of unusual summer heat, the waters of its pond evaporate, when it takes shelter under stones or pieces of bark and in such damp places awaits the refilling of its pond by the fall rains.

The species breeds in the early spring, depositing the eggs singly or in pairs. The eggs are covered with a glutinous envelope and are deposited in such a manner that they adhere to the leaves of aquatic plants. The larvæ possess branching gills like those of the larvæ of the true salamanders. These gills often persist until the animals have reached a length of three inches or more, although absorption usually occurs when the larva is about two inches in length. Thus the transformation appears to be irregular, and not infrequently perfectly developed Water Newts are found that are barely one and one-half inches in length. The metamorphosis is undoubtedly hastened by the warmth of shallow ponds. After the gills have disappeared, the matured individual continues to lead an aquatic life, although if forcibly removed from the water and kept in a damp place, it will live for an indefinite time, breathing with a rapid trembling of the throat, which is the same as the respiratory gulping of the frogs.

The Red Eft, or Mountain "Lizard," *Diemyctylus viridescens miniatus* Raf. (Fig. 15), is a Water Newt which has deserted the ponds in mountainous districts and has taken up life in the damp woods. It is not, however, a distinct variety, since its terrestrial existence is irregular, and it frequently returns to the water to lead an aquatic life. The Red

Red Eft, or  
Mountain  
"Lizard."

Eft is merely a phase of the common Newt, but it is an interesting case of adaptation to environment.

Few observers who have visited mountainous places in the eastern United States have failed to notice in the damp woods the brilliant red "lizards" slowly making their way over the carpet of fallen leaves. Among residents of the country places they are known as Red Efts, Fire "Lizards" and Rain "Lizards." These are not lizards, but they are batrachians, and they represent a form of the common Newt that has seemingly tired of the water and begun a terrestrial existence. The animals vary in color from dull brown to brilliant vermillion. Rows of red dots



FIG. 15. THE RED EFT, OR MOUNTAIN "LIZARD"

From specimen in New York Zoölogical Park

are very apparent on the brown forms, while on the vermillion forms they are less distinct, but can be discerned as richer red, bordered with narrow circles of black. The brown specimens are forms that have left the water but a short time; those of the brilliant red hues have for some time been leading a terrestrial life. During dry weather the Red Efts hide under leaves and moss; after the summer showers they issue from their hiding-places to swarm through the woods.

In mountain ponds in the heart of districts where the red form is very abundant, the aquatic adults may be found swarming in the water. If the latter are taken from the water and kept in damp moss or among leaves, they lose their greenish tints and the smooth appearance of the skin, becoming dull brown and

rough, an indication of the red hue and rough skin of the terrestrial form. If, on the other hand, specimens found in the woods be placed in an aquarium, they at first show signs of marked distaste for their new quarters. After a time, however, they become reconciled to the water and lose their bright tints, thus beginning to assume the colors of their aquatic associates, while the tail grows broader and better suited for swimming. Very small, bright red forms are often found in the woods, demonstrating that such specimens have left the water immediately after completing the larval stage.

As an explanation of the eccentricities of this species it may be explained that the cool depths of the mountain forests, continuously and heavily shaded, and well saturated with moisture, offer the species an inducement to vary its life history. Close to New York City, where the red form is unknown, the writer has observed an intimation of this terrestrial tendency. In the thick woods of the Palisades of the Hudson, he has found occasional Newts hiding under pieces of bark that rested a few feet from the edge of a pool inhabited by numbers of the kind. Such specimens showed a tinge of brown like the form *miniatus*.

The terrestrial form has been described as possessing a much rougher skin and lacking the fin-folds of the tail of the aquatic form. These characters, however, are caused merely by the drying of the skin.

In the aquarium, the water form is an interesting creature, and may be kept in flourishing condition by feeding it small earthworms or small pieces of raw beef. The red form lives well in a vivarium which has been plentifully supplied with damp moss. It will eat the larvæ of ants and small earthworms. It may be found in the Highlands of the Hudson River. Its range of distribution is much the same as the water form, except that it occurs principally in mountainous districts.

## TOADS AND FROGS.

Order *Salientia*.

The Toads and Frogs are the most familiar forms of the batrachians. Eleven species occur in the local fauna, representing four families. All of the local species deposit their eggs in the water and the young pass through a tadpole stage before acquiring the form of the adult. The duration of this larval stage varies considerably with the different species. In some it is limited to a few weeks, others require considerably more than a year to complete their metamorphosis. The growth in the water is much influenced by light and temperature.

For a short time after hatching, the tadpoles of most species are provided on the under surface of the head with two suckers. These organs enable the fragile creatures to cling to the leaves of aquatic plants instead of lying upon the muddy bottom, where they would be exposed to the attacks of many enemies in the shape of the carnivorous larvæ of aquatic insects. At the time of hatching, the young creatures are leech-like in appearance. Development is rapid. Within three days they present the complete form of the tadpole, with fin-like tail. Within a few hours after hatching the mouth-parts begin to develop, and a few days later the little creature feeds upon delicate aquatic vegetation. They then swim readily in search of food, and the suckers become aborted and quickly disappear.

For a few hours after leaving the egg, the frog tadpole possesses branching gills. These soon shrivel and their bases are covered with folds of skin (the "operculum"). Under this fold the fore limbs soon begin their growth. This is the first pair of limbs to acquire full growth, but they are not visible until after the hind pair has appeared. From external appearances the frog tadpole thus seems to acquire the posterior pair of limbs first. Somewhat later the front pair suddenly are thrust through the



folds of the operculum. This is in contrast with the larvæ of the salamanders, in which the operculum is absent and the fore limbs are nearly full grown before the rear pair is visible. Moreover, the tadpoles of the salamanders retain their gill-stalks on each side of the head until after the growth of the limbs is completed.

A popular key to the identification and classification of the Toads and Frogs follows:

*Key to the Toads and Frogs.*

- I. Tips of toes (digits) expanded in the form of adhesive disks or "suckers"..... **The Tree Toads.**
  - a. SIZE VERY SMALL.
    1. *Disks but slightly developed.*  
Brown; a wide green band on the back..... **Cricket Frog** (*Acris gryllus crepitans*).  
Gray; three brown bands on the back..... **Swamp Tree Toad** (*Chorophilus triseriatus*).
    2. *Disks well developed.*  
Brown to green (varying); a dark, X-shaped mark on the back..... **Pickering's Tree Toad** (*Hyla pickeringi*).
  - b. SIZE SMALL.  
Bright green above, which hue is bordered on sides with a band of white. A purplish band from behind nostril.... **Anderson's Tree Toad** (*Hyla andersoni*).  
Grayish, with wavy, irregular markings..... **Gray Tree Toad** (*Hyla versicolor*).
- II. No digital disks. Size moderate to large..... **The Toads and Frogs.**
  - a. SIZE MODERATE.
    1. Skin thickly studded with wart-like tubercles; a large gland behind the eye..... **The Toads.**  
Pupil of eye horizontal..... **Common Toad** (*Bufo lentiginosus americanus*).  
Pupil vertical..... **Spade-foot Toad** (*Scaphiopus holbrooki*).

2. Skin smooth; no gland behind eye ..... **The Frogs.**
- 2a. A vein-like fold of skin from behind eye to the groin.  
 Pale brown; a dark-brown blotch behind the eye ..... **Wood Frog** (*Rana sylvatica*).  
 Olive, with large, round, black spots, irregularly scattered... **Salt-marsh Frog** (*Rana virescens*).  
 Pale brown, with four rows of large black spots ..... **Leopard Frog** (*Rana palustris*).  
 Green or olive; head paler..... **Pond Frog** (*Rana clamitans*).
- 2b. No vein-like fold of skin.
- b. SIZE LARGE.  
 Olive, irregularly mottled with brown ..... **Bull Frog** (*Rana catesbiana*).

#### DESCRIPTIVE LIST OF THE TOADS AND FROGS.

The Common Toad, *Bufo lentiginosus americanus* Le Conte (Fig. 16), is of moderate size and stout form. The skin is very rough. A large and prominent gland exists behind the eye. Color above brownish or yellowish brown, with numerous large dark spots, narrowly, though distinctly, edged with pale yellow. Extending down the center of the back is a pale yellowish or whitish band. The abdomen is dirty white. The ground color varies in individuals, some being distinctly reddish, and is influenced by temperature and changes on the individual itself from a lighter to a darker shade or the reverse. The pupil of the eye is horizontal.

The Toad is a familiar creature and is quite characteristic in appearance on account of its very rough glandular skin and the large, swollen glands behind the eyes. The hind feet are but slightly webbed. The blackish hue of the skin under the throat of the male Toad distinguishes it from the female. This skin is capable of great extension as the creature gives voice to the peculiar cry of the breeding season. The females are larger than the males. Length of body of male specimen,  $2\frac{3}{8}$  inches; of female,  $2\frac{3}{4}$  inches.

*Range:* Four varieties of this species inhabit North America. One of these appears to occur only in northeastern Massachusetts; another is confined to the Rocky Mountain region; the typical form is found in the southeastern United States, while the variety that occurs locally is distributed over an extensive area, namely: from British America to the Southern States and westward to Arizona.

*Local Distribution:* Common and abundant.

There is but one species of the local batrachians which



FIG. 16. THE COMMON TOAD  
From specimen in Am. Mus. Nat. Hist.

might be confused by the observer with the Common Toad, and that is the Spadefoot Toad. The Spadefoot Toad receives its name from a pronounced spade-like process on the inner edge of the hind foot, a feature which is also slightly developed on the common species. The color of the Spadefoot is, however, quite different from the ordinary toad. Instead of the single light band along the back of the Common Toad, the Spadefoot has two pale bands, which run together and fork at the end of the body.

Many of the reptiles and batrachians have habits which render them of considerable economic value to the agriculturist,

but the Toad ranks first in the list of useful species. Although mainly insectivorous, the depredation on insect life made by the frogs is chiefly confined to the borders of ponds and streams, or to the marshes; in fact, to places not available for agriculture. The Toad, on the contrary, is a terrestrial species, inhabiting the open country and abounding over stretches of farmland. Here at twilight multitudes of toads issue forth to prey upon all forms of insect life, continuing the hunt throughout the night, and retiring at dawn for digestion. The examination of a toad's stomach after a nocturnal excursion will reveal an amazing number of insect forms, among which may always be found species that are destructive to agricultural products.

Among the writings of Shakespeare there are allusions to the venomous character of the Toad which have inspired innumerable scientists to clash in argument. Comparatively recent anatomical investigations have resulted in the discovery that a milky secretion contained in the swollen glands situated behind the eyes and in minute glands scattered over the surface of the skin possesses decidedly poisonous properties. When this fluid is injected into the blood of small mammals, marked symptoms at once develop and speedy death follows. The symptoms produced have been described as similar to those due to the use of *digitalis*, the action being upon the nerve centers and the heart. The effect upon any unwary dog that seizes a toad in its jaws is at once evident. There are immediate signs of distress, and the animal soon foams at the mouth and champs its jaws as if in considerable pain. These symptoms continue for an hour or more.

When the larger glands on the head are compressed, tiny jets of a sticky white fluid are ejected to a distance of three or four inches. Through accident the writer has discovered that this fluid is intensely bitter to the taste. In spite of this poisonous secretion, the Toad is generally harmless when handled. The story of wart-producing powers, furthermore, is purely fallacious. The secretion in the glands which have been mentioned is dangerous only when injected directly into the blood of small animals, but nevertheless Shakespeare's much-combated references have been proved to have abundant foundation in fact.

Most batrachians, particularly those species with a rough skin, secrete a certain amount of this irritant.<sup>1</sup>

The Toad is protected by the characters just mentioned from attack by most mammals and birds. The species of snakes, however, that prey upon cold-blooded creatures, appear to prefer toads to frogs.

In its metamorphosis the Toad differs somewhat from the frogs. It leaves its place of hibernation rather late, not until warm weather has become established in the spring, when the weird, drawn-out trill of the males is heard about rain pools and shallow bodies of still water. The eggs are deposited in long strings.<sup>2</sup> After the strings have absorbed the required amount of water through their transparent covering and lie upon the bottom undergoing development. Each egg measures about a quarter of an inch in diameter. The tadpoles emerge from the eggs after a period of eight to ten days from deposition. They resemble minute leeches and cling for some hours to the leaves of aquatic plants by means of small suckers on the lower surface of the head. Within forty-eight hours they cease the clinging stage and wriggle their way about by means of a rapidly developing, fin-like tail. Four days after hatching they are agile swimmers and feed upon mossy growths of the pool.

The writer has made the following observations upon growth during the tadpole stage:

May	3.	Tadpoles hatched. Clinging stage.....	Length,	$\frac{1}{8}$ inch
"	4.	Body more elongate; swimming feebly at frequent intervals.....	"	$\frac{3}{16}$ "
"	5.	Tail distinctly compressed.....	"	$\frac{1}{4}$ "
"	6.	Tail shows fin-like edges.....	"	$\frac{9}{32}$ "
"	7.	Tail fully developed; feeding.....	"	$\frac{5}{16}$ "
"	12.	Body assuming stout proportions.....	"	$\frac{1}{2}$ "
"	17.	Color above jet black.....	"	$\frac{3}{4}$ "
"	25.	Tadpoles appear fully grown and cluster in masses in very shallow places.....	"	$1\frac{1}{16}$ inches

<sup>1</sup> Among the local frogs the character named is strongly evidenced by the Leopard Frog (*Rana palustris*). When handled, this species gives out a strong odor. Few snakes will eat it.

<sup>2</sup> The eggs of the frogs are deposited in masses.



- May 26. Rudiments of hind limbs discernible.
- " 30. Hind limbs perfectly formed in miniature and measure  $\frac{3}{16}$  inch in length. The tadpoles are now brownish and show traces of spots. . . . . Length  $1\frac{5}{8}$  inches
- June 4. Hind limbs  $\frac{3}{8}$  inch long.
- " 5. " "  $\frac{7}{16}$  " "
- " 12. " " fully developed. . . . . "  $1\frac{1}{4}$  "
- " 14. Front limbs break through operculum.
- " 16. Absorption of tail rapidly taking place.
- " 18. Tail nearly absorbed; young toads leaving the water.
- " 20. Metamorphosis complete; surrounding meadows teeming with perfectly developed toads measuring  $\frac{7}{16}$  inch (body).

The full-grown tadpole of the Toad and the perfectly developed creature as it leaves the water, are much smaller than the frog tadpole, which usually attains a length of three and one quarter inches before growth of the hind limbs begins, while the perfect frog generally measures an inch or more when it becomes fitted for semi-aquatic life. The tiny toads fall a prey to many enemies, and but a small proportion of their numbers attains maturity. Full growth is reached in about three years.

The Spadefoot Toad, *Scaphiopus holbrookii* Harlan (Fig. 17), is moderate in size. In form it is very stout, with wide, blunt head. Color, dark brown, or ashy-brown, with two rather indistinct bands of paler shade on the back; these bands begin behind the eyes and extend in wavy or irregular fashion to the end of the body, where they run together.

Although the skin is rough and is covered with numerous raised points, it presents a smoother surface than that of the Common Toad. The parotid gland (behind the eye), though well-developed and very pronounced, is of smaller size in proportion to the individual than that of the Common Toad.

On the inner portion of the under surface of the hind foot there is a hard, spade-like process, tinged at the edge with deep black. From this appendage the creature derives its name. The hind foot is fully webbed. The pupil of the eye is elliptical

(cat-like), a characteristic which is useful in distinguishing this species from the Common Toad, since in the latter the pupil is horizontal.

The species presents some variation in color pattern. Specimens from the northern portions of the United States are sometimes nearly uniform in color, while those from the extreme South possess a very distinct pattern. Length of body, in sitting posture,  $2\frac{1}{2}$  inches; total length, hind limbs outstretched, 5 inches; width of head over ear plates  $1\frac{1}{8}$  inches.

*Range:* The entire eastern United States, from New England to Florida and westward to Texas.



FIG. 17. THE SPADEFOOT TOAD  
From specimen in New York Zoölogical Park

*Local Distribution:* Rare.

The retiring habits of the Spadefoot Toad render it an object seldom seen. The animal employs the sharp scoops of its hind feet to work its way into the soft ground or sand, and there passes the hours of daylight entirely hidden. At night or after heavy showers it ventures abroad for food, sometimes lingering in the vicinity of a rain-pool and uttering its plaintive cry. During the latter part of April and in May this toad congregates in numbers about shallow bodies of water to breed. The voice of the male resembles the tremulous call of the Common Toad, but is slightly louder. The eggs are similar to those of the Toad, and are laid in strings. The metamorphosis is completed within a few weeks from the time of hatching.

The Cricket Frog, *Acris gryllus crepitans* Baird (Fig. 18), is very small. The skin is rough. The body color is brown or grayish brown. Extending from the snout nearly to the end of the body there is a wide band of bright green, which is interrupted between the eyes by a dark triangular blotch, with its point directed backwards. There are three small blotches on the sides, while the hind limbs are banded with dark brown. Beneath, the color is yellowish white.

Cricket  
Frog.

This species is subject to rapid and marked color changes

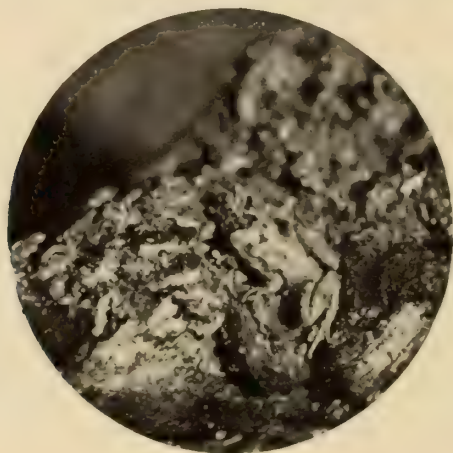


FIG. 18. THE CRICKET FROG

From specimen in New York Zoological Park

under the influence of varying temperature and the mood of the individual. These changes affect the general color of the body and the bright band down the back. The band, although usually of some shade of green, sometimes fades to yellowish brown. The species is easily distinguished on account of its distinct color pattern. It is the smallest of the local, tailless batrachians. Length of body,  $\frac{3}{8}$  inch; total length with hind limbs outstretched,  $2\frac{1}{4}$  inches.

*Range:* The typical form occurs from North Carolina to Florida, and westward to Louisiana. The variety *crepitans*, also, is found from the southern portion of New York State to North Carolina; it extends westward to Kansas, and still farther westward in the extreme northern portion of its range.

*Local Distribution:* The local form, var. *crepitans*, is common in portions of Long Island and in New Jersey.

The Cricket Frog frequents the borders of shallow pools, where its sharp, trilling cry, resembling in volume the call of the field cricket, may be heard at various times of the year. It is particularly vociferous during the breeding season. The eggs are deposited early in May in small bunches. They usually adhere to grass or reeds.

The animal is very difficult to capture, since it possesses



FIG. 19. SWAMP TREE TOAD  
From specimen in Am. Mus. Nat. Hist.

great leaping powers and quickness in diving. During periods of heavy dew these frogs may be found in high grass adjacent to marshes. Owing to its smallness and agility, it is rarely observed after the breeding season.

The Swamp Tree Toad, *Chorophilus triseriatus* Wied. (Fig. 19), although a very small species, is larger than the Cricket Frog. It may be readily recognized by the coloration. The ground color is pale gray. On the back are three dark brown stripes or bands, extending the length of the body. On the side is a broader band, extending from the snout

Swamp  
Tree Toad.



across the eye and thence along the greater length of the body. The abdomen is whitish, with a few scattered black dots. Length of body,  $1\frac{1}{16}$  inches; total length, with hind limbs outstretched,  $2\frac{1}{4}$  inches.

*Range:* This is essentially a western species. It is very abundant in the northwestern portion of the United States, east of the Rocky Mountains, whence it extends southward into Texas. The range extends eastward in the shape of a narrowing band which terminates in central and southern New Jersey. In this apex of its eastern distribution the species is common, especially in the swampy areas of the barrens of the southwestern part of the State.

*Local Distribution:* Mr. W. D. W. Miller has taken many specimens near Plainfield, N. J.

Like other species of the *Hylidæ*, this creature leaves its winter quarters early and gathers about shallow pools and ditches to breed. It is not an agile swimmer, since the hind feet are not webbed. If alarmed when near the water, it wriggles its way into the marginal vegetation so quickly that it is difficult to capture. Its cry is a sharp trill like that of the Cricket Frog.

Pickering's Tree Toad, or "Peeper," *Hyla pickeringi* Storer (Fig. 20), is a very small animal. The body is pale brown above with distinct, narrow markings on the back which assume the form of an X on the upper portion of the back, behind which is a  $\wedge$ -shaped marking. At the end of the body there is another mark, similar to the latter, but of about half the size. A similar mark with the point directed backwards occurs behind the eyes. A band of the same dark color that constitutes the markings on the back extends from the snout across the eye, and thence down the side to a short distance behind the fore limb. The hind limbs are banded. Beneath, the color is yellowish white.

Although the color-pattern is generally pronounced, and the usual colors of the species are as described, this individual varies greatly in color, not only in different individuals but also in the same individual at different times. The writer has observed specimens of normal colors change to pale gray, and



others to a bright tint of green. While the animal was in the green phase, the pattern on the back could not be discerned.

The toes are provided with well-developed adhesive disks, or "suckers," which are particularly distinct on the fore feet. The skin of the abdomen is coarse and granulated; that of the back is smooth.

Male specimens of this species may be distinguished from the females by the loose, dark skin on the throat. This loose skin constitutes the vocal sac, an organ capable of great ex-



FIG. 20. PICKERING'S TREE TOAD  
From specimen in New York Zoölogical Park

pansion while the animal is uttering its shrill mating call. Length of body,  $1\frac{1}{8}$  inches; total length, hind limbs outstretched,  $2\frac{1}{2}$  inches.

*Range:* The entire eastern and central portions of the United States, abundant.

*Local Distribution:* Common, but not easily seen.

Only three representatives of the genus *Hyla* are found in this vicinity.<sup>1</sup> The species are easily distinguished from one another by their characteristic color-patterns, and from other tailless batrachians by their peculiar feet and the disks on the toes.

<sup>1</sup> One species, the *Hyla andersoni*, is of doubtful occurrence, although it is included in this Leaflet.

With the first mild days of spring, the bogs and marshes resound with the cheery, piping notes of the males of this species, the peculiar character of which has given rise to the popular name of "Peeper." Specimens are difficult to find, since they hide among the blades of the coarse grass, and when disturbed take refuge in the water. After the breeding season the animals



Miss Mary Dickerson, Photo.

FIG. 21. ANDERSON'S TREE TOAD

leave the bogs and live among the leaves and low bushes and rank vegetation, and their sharp cries are seldom heard. To produce the piping cry, so intense and penetrating for so small a creature, the male fills his vocal sac with air until it is more than half the size of the body. Then the air is expelled with such energy that the sides of the tiny creature become hollow with the convulsive effort. The eggs of this species are deposited in small masses and hatch quickly. The tadpoles undergo a rapid metamorphosis.

Anderson's Tree Toad, *Hyla andersoni* Baird (Fig. 21), is of moderate size. The disks on the toes are well developed. Bright pea-green above with a narrow, though very distinct, white border on the sides and upper surfaces of the limbs. A narrow, purplish brown band extends from behind each nostril, across the eye and to the base of the fore limb. The lower sides are purplish brown, though of a lighter shade than the band, and are ornamented with irregular spots of a lighter and richer hue. The abdomen is pinkish white, though its edges are suffused with the purple tinge of the sides.

Anderson's  
Tree Toad.

This species is of great rarity, and but very few specimens have ever been captured. It is a most attractively colored creature, and on account of the pale green of the upper surface resembles the European Tree Toad. Mature specimens are from an inch and a quarter to an inch and a half in length.

*Range:* The species is so rare that its range has not yet been determined, but is supposed to extend from southern New York to Florida. The species has been found in South Carolina.

*Local Distribution:* One specimen has been taken at Jackson, N. J., another at May's Landing and still another (represented in the figure) at Lakehurst, in the same State.

The Gray Tree Toad, *Hyla versicolor* Le Conte (Figs. 22 and 28), is of moderate size and stout form. The ends of the toes are disk-like and adhesive. Color above, usually pale lichen-gray, with large wavy and irregular markings of darker shade. On the hind limbs these darker markings are so disposed that they appear to form two bands when the limbs are folded. Abdomen uniform grayish white; lower portion of hind limbs tinged with bright yellow.

Gray Tree  
Toad.

The skin is very rough and is covered with minute, warty points on the back. Male specimens differ from the females in having loose, dark skin under the throat.

The species exhibits great variation in color according to light, temperature and the temperament of the individual. From the pale, ashy gray ordinarily present, the color varies to brown, very dark gray, or to vivid green. With the variation

of color the pattern becomes obscure or more prominent. Length of body, 2 inches; total length with hind limbs outstretched,  $4\frac{5}{8}$  inches.

*Range:* The entire eastern and central portions of the United States, from Maine to Florida, and westward to Texas.

*Local Distribution:* General and fairly abundant.

The call of the Gray Tree Toad is a loud clattering sound, and resembles the scolding of a frightened chipmunk or red squirrel. It is said that the Tree Toad is particularly vociferous before a coming rain. Like other prognosticators of the weather, however, these creatures are quite unreliable. Their cries are



FIG. 22. THE GRAY TREE TOAD  
From specimen in New York Zoölogical Park

particularly frequent during the sultry intervals that follow a light summer shower. After the breeding season is over, this Tree Toad frequents trees and usually takes up its abode at some elevation above the ground. It is supposed to deposit its eggs during the latter part of May or early in June. Small weedy ponds are usually selected as breeding-places. The eggs hatch quickly and the transformation from the tadpole stage is rapid.

The Salt-Marsh Frog, *Rana virescens* Kalm (Fig. 23), is of moderate size and rather slender form. Ground color bronze to olive or bright green, but always vividly marked with large and irregularly scattered round spots of dark brown or black; on the back several of these spots are very elongate. The spots are more regularly disposed on the hind limbs, and when the legs are flexed, they have a banded

**Salt-Marsh  
Frog.**



appearance. Over each eye there is a rounded spot, placed slightly inwards towards the center of the head.

A raised, vein-like fold of skin extends from behind each eye to the end of the body and is pale bronze in color. A stripe of similar color extends on each side of the head from the tip of the snout to behind the earplate, where it terminates in a raised skin fold. The under parts are white, indistinctly mottled with gray about the limbs.

When examined from directly above, the arrangement of the spots on the back appears to be irregular. This character may be employed to distinguish the species from the Leopard Frog,



FIG. 23. THE SALT-MARSH FROG  
From specimen in New York Zoölogical Park

which it resembles in form and pattern. On the Leopard Frog the spots are rather square in shape and are quite regularly disposed in rows down the back and the sides. Length of body,  $3\frac{1}{2}$  inches; total length, hind limbs outstretched, 9 inches. These measurements were taken from a very large specimen. The average length of body is about  $2\frac{3}{4}$  inches, and total length more than 7 inches.



*Range:* Maine to Texas. Several varieties of the species are recognized, some of which occur in the Western States, Mexico and Central America.

*Local Distribution:* Abundant in swampy situations near the coast.

The Salt-Marsh Frog, sometimes called the Field Frog, inhabits swampy meadows rather than large bodies of water, and is common in many brackish swamps in this vicinity, although it is also found in fresh-water swamps. It is particularly abundant in the Newark meadows. The vocal sacs of the males are



FIG. 24. THE LEOPARD FROG, OR PICKEREL FROG  
From specimen in Am. Mus. Nat. Hist.

very prominent externally and become distended as the species gives voice to its sharp, rasping call.

The Leopard Frog, or Pickerel Frog, *Rana palustris* Le Conte (Fig. 24), is of moderate size and rather slender form. Ground color above, pale brown, with four rows of large square spots, two rows down the back and one on each side. **Leopard, or Pickerel, Frog.** These spots are very dark brown or black. The hind limbs are banded with the same color, which is also present in irregular spots on the fore limbs. There is a large spot over each eye, and one directly over the snout. The upper lips are dark brown, and above this color there is a band of pale bronze.

Four ridges or elevated folds of the skin extend down the back, the two outer rows of which are vividly tinged with light bronze; the two inner folds traverse the centers of the rows of dark spots on the back. The abdomen is silvery white. The under surface of the hind limbs is bright yellow, as is also a small area behind each fore limb.

The species may be distinguished from the Salt-Marsh Frog by the regularity of the rows of spots. It is the most showy of our local frogs.

*Range:* Eastern North America.

*Local Distribution:* General.

The Leopard Frog is a wanderer, traversing and frequenting stretches of damp meadows and fresh-water swamps. It is sometimes found a considerable distance from the water. Young specimens are most numerous about shallow, slow-running streams bordered with dense vegetation.

When in danger this frog exudes through its skin an acrid secretion which protects the creature from its enemies. Few snakes eat these frogs. They are said, however, to be good bait for pickerel on account of their bright colors; hence one of the popular names, the "Pickerel Frog."

The Pond Frog, or Green Frog, *Rana clamata* Daubin (Fig. 25), is a large species. Form, stout. Dark brown or olive-green above, with an irregular sprinkling of darker spots; head usually bright green. White beneath, with an obscure marbling of gray about the under surface of the limbs; throat of the male generally yellow; of the female, white, marbled with gray.

**Pond, or  
Green,  
Frog.**

The color of the individual varies with the changes in light and temperature. A common phase displays much vivid green about the head and anterior portion of the body, while the posterior portion is brown or olive. Sometimes the entire body is green, in other instances dull brown. The male may be distinguished from the female by his much larger earplate (tympanum).

This species resembles the Bull Frog, but may be readily distinguished therefrom by a marked anatomical character: on each side, beginning behind the eye and extending nearly the

entire length of the body, there is a vein-like ridge or fold of skin. The Pond Frog is, moreover, considerably smaller. Average length of body,  $3\frac{1}{2}$  inches; total length, with limbs outstretched,  $7\frac{3}{4}$  inches.

*Range:* Eastern and central United States and southern Canada.

*Local Distribution:* General and abundant.

With the possible exception of the Toad, the Pond Frog is the most familiar of our local batrachians. It is found everywhere and abundantly in ponds and streams, where its familiar



FIG. 25. THE POND FROG, OR GREEN FROG

From specimen in Am. Mus. Nat. Hist.

croaking may be heard during the summer months. The eggs are deposited in masses early in the spring. The jelly-like clusters containing the numerous black dots representing the developing embryos are familiar objects. The tadpoles are rather slow in growth, generally consuming two seasons before they complete their metamorphosis, according to the temperature of the water and its exposure to sunlight. In the fall the tadpoles burrow into the mud and hibernate. The average tadpole is three inches in length when the limbs are well advanced in growth, and the young frog, immediately after absorption of the tail, measures slightly more than an inch. Tadpoles



confined in indoor aquaria are much retarded in their growth, and many remain as such for a period of three years or more.

The Bull Frog, *Rana catesbiana* Shaw (Fig. 26), is very large and stout. Limbs short but powerful. Hind feet large and very fully webbed. Head wide. Color above, light olive, irregularly blotched or marbled with dark olive or brown. The intensity of these markings varies with individuals and the disposition of the individuals themselves. Limbs, especially the hind pair, with brown blotches which to-

**Bull  
Frog.**



FIG. 26. THE BULL FROG  
From specimen in New York Zoological Park

ward the extremities assume the form of bands. The under parts are silvery white, with grayish markings, the throat in many individuals assuming a yellowish tinge. The portion of the head between the mouth and the eyes is usually tinged with pale green; the upper surface, however, matches the general color of the body.

Half-grown specimens resemble the adult of the Pond Frog, but may be recognized by the absence of the vein-like fold of

skin which is present on each side of the body in that species. There is, in fact, no trace of this in the Bull Frog. A full-grown specimen will measure  $14\frac{1}{2}$  inches from the tip of the snout to the end of the outstretched limbs, and  $6\frac{3}{4}$  inches when in a sitting position. Such a specimen would weigh about one pound.

*Range:* The eastern and central portions of the United States and southern Canada.

*Local Distribution:* General, but not so abundant as the Pond Frog.

The Bull Frog frequents larger bodies of water than the common Pond Frog, being especially partial to large ponds and slow-running rivers, where the banks are lined with overhanging vegetation in which it can find concealment. The tadpoles grow to a greater size than those of the Common Frog. They may be distinguished by their distinctly yellowish abdomen. During the hours of sunlight they have a habit of lying in shallows around the borders of the pond, but upon the slightest disturbance they scurry for deeper water with startling activity and swim close to the bottom in order to leave a trail of muddy water, agitated by the thrashing of their tails. This maneuver tends to conceal their exact location.

Bull Frogs, particularly young specimens, have a peculiar habit of emitting a sharp cry when disturbed on the bank, and instead of plunging directly into the water, they skim over the surface for a short distance. The Common Frog, on the other hand, when disturbed, jumps into the water and instantly dives to the bottom, where, with a quick kicking of the hind limbs, it stirs up a cloud of mud in which it can conceal itself.

The Bull Frog is a most voracious creature. Mature specimens do not hesitate to swallow any moving object of about their own size that may come within reach of the wide gape of their jaws. They are largely insectivorous, but birds and small rodents are frequently eaten. Captive specimens experience no difficulty in swallowing sparrows or half-grown rats.

The call of a Bull Frog differs from the ordinary "croak" of a Pond Frog. It is a deep, protracted bass, resembling the sound made by drawing a bow for half its length across the string of a bass-viol. The note is repeated four to six times.



The eggs of the Bull Frog are laid in May. During the latter part of July or in August of their second summer the tadpoles acquire limbs and leave the water as perfect frogs.

The Wood Frog, *Rana sylvatica* Le Conte (Fig. 27), is of small size. It is light brown above, with a dark brown spot on each side of the head. This spot extends from the snout through the eye (darkening the lower half of the iris), covers the earplate and adjacent area and terminates in a sharp angular outline with a fold of the skin behind

Wood  
Frog.



FIG. 27. THE WOOD FROG  
From specimen in New York Zoological Park

the base of the fore limb. A whitish line in strong contrast with the dark color on the sides of the snout traverses the upper lip. There is a smaller dark spot near the base of the fore limb. The hind limbs are indistinctly banded on the upper surface. The abdomen is silvery white.

Two well-defined ridges, or vein-like folds, extend down the back of this easily-recognizable species. In different specimens the body color varies somewhat, some are distinctly reddish. The characteristic dark spot on each side of the head is always apparent, however, and facilitates identification. Length of body,  $2\frac{1}{4}$  inches; total length, with hind limbs outstretched,  $5\frac{3}{4}$  inches.

Range: Like many of the North American frogs, it is gener-

ally distributed over the eastern and central portions of the United States and southern Canada. It does not extend, however, into the sandy portions of the Southern States.

*Local Distribution:* The Wood Frog appears to be restricted to certain areas, in which it is abundant. The writer has found it common in the woods along the Palisades of the Hudson River and in Westchester County, N. Y.

The Wood Frog, even where it is abundant, is not often seen, on account of its habit of living among the fallen leaves of timbered districts and the fact that its sober colors almost precisely match the dead leaves. It is aquatic only in the spring, when it frequents small bodies of water for the purpose of laying its eggs. At such times the croaking of the many males indicate the first awakening of the cold-blooded creatures from their winter sleep, for the Wood Frog lays its eggs before the ice has entirely left the ponds. The writer has repeatedly observed them as early as March. The eggs are deposited in masses from two to three inches in diameter, and hatch within ten days. The tadpoles grow rapidly and, unless their pool receives the water from cold springs, complete their transformation early in the summer. They are black above and bright golden bronze beneath. Upon leaving the water the young frog is slightly more than half an inch in length.



FIG. 28. THE GRAY TREE TOAD  
From specimen in New York Zoölogical Park  
[52]

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AMERICAN MUSEUM OF NATURAL HISTORY

# The Development of a Mollusk



By B. E. Dahlgren, D.M.D.

American Museum of Natural History

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL

VOL. VI, No. 1, JANUARY, 1906

Guide Leaflet No. 21



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MODEL 21. FRONT VIEW  
The fully formed mollusk larva, or veliger.

# The Development of a Mollusk

A Guide to the Series of Models  
Illustrating the Development of *Crepidula*  
in the  
Department of Invertebrate Zoölogy

By

B. E. DAHLGREN, D. M. D.

American Museum of Natural History

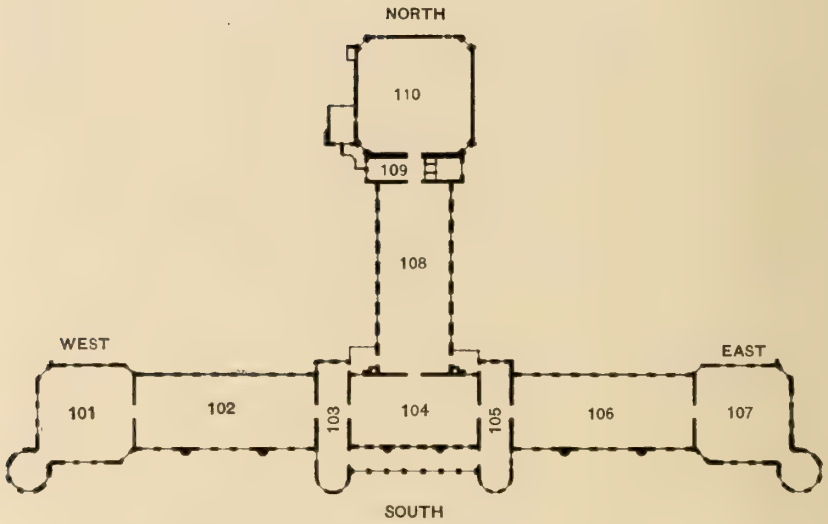
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VOLUME VI, No. 1, JANUARY, 1906.

New York. Published by the Museum.

## FIRST FLOOR



The models illustrating the development of a mollusk as shown in the life history of the Gastropod *Crepidula* are exhibited in the Hall of Invertebrate Zoölogy, No. 107 of the East Wing, first floor of the Museum building.



## THE DEVELOPMENT OF A MOLLUSK.<sup>1</sup>

A GUIDE TO THE SERIES OF MODELS ILLUSTRATING THE DEVELOPMENT OF CREPIDULA.

BY B. E. DAHLGREN, D.M.D.,  
American Museum of Natural History.

### INTRODUCTION.



THE problem of how living organisms arise must have ever presented itself to the questioning mind. The processes involved in the origin of new individuals nevertheless remained for ages an unsolved mystery. The most familiar example, the origin of the young bird from an egg, cannot have failed to arouse the interest even of primitive man. It must also have furnished the first suggestion towards an explanation. Although undoubtedly long unsuspected, in time it became known that every animal which does not multiply by simple division into two like the very lowest arises from an egg, which is either hatched or developed within the body of the parent. Until a century and a half ago it was generally believed that the egg contained a miniature animal, which became perfected during incubation. Not until the substance called protoplasm had been recognized as the universal "physical basis of life," and, by the aid of the microscope, all living bodies had been found to be composed of cells, was anything like a correct understanding of the nature of the egg and its development attained. The egg was found to be a cell derived like all other cells by the division of a preëxisting cell. Its development, resulting in the formation of the myriad cells of a new individual, was found to proceed by a process of cell-division, essentially similar to that by which growth takes place in the adult.

<sup>1</sup>Reprinted from *The American Museum Journal*, Vol. VI, pp. 28-53. Jan., 1906.

Out of the discovery of the character of the egg, of its origin from a parent cell and of its processes of development grew numerous other problems demanding the attention of investigators. Thus the science of embryology came into existence. This science seeks to discover every step in the development of an organism and to trace resemblances and differences of structure and form from their very earliest beginnings. It investigates the conditions which influence development and seeks to discover the factors which determine each step in the formation of an organism, to what extent development is dependent upon external causes and to what extent it is predetermined by the internal organization of the egg. It seeks to determine precisely what this internal organization is and to explain the manner in which the reproductive cell becomes the bearer of the characters of the parents and by what process it is able to transmit these to the offspring.

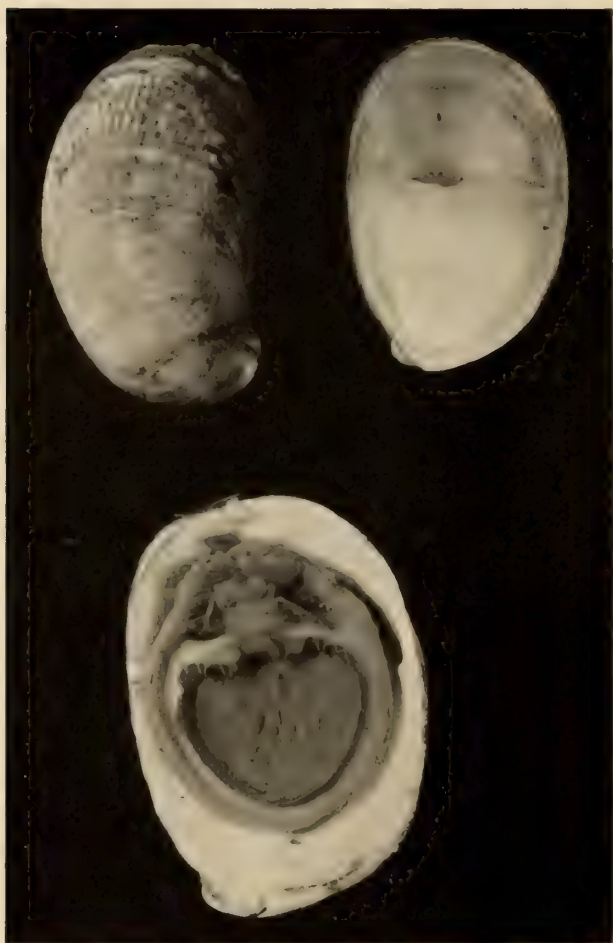
The comparison of the development of different animals soon revealed striking similarities at certain stages. It was found that after cell-division had proceeded to a certain extent the developing egg assumed a form resembling a mulberry (the morula); that later the cells invariably became arranged in the form of a hollow sphere (the blastula), this in turn giving rise to a somewhat more complicated flask-shaped form (the gastrula). It was seen that these various stages presented remarkable correspondences to certain lower forms of life. The analogy of the undivided egg to a simple unicellular protozoan; of the mulberry, or morula, stage to simple aggregations of unicellular animals such as are found among the lowest forms of life; of the blastula to certain Flagellates which occur in the form of hollow, free-swimming, multicellular spheres, and the apparent analogy of the gastrula to certain polyps led to the theory that the developing animal, in the course of its formation from the egg, passes successively through the forms of a whole series of lower organisms which may be considered as its ancestral types.

Formulated at a time when the evolution theory had been recently advanced, this corroborative theory aroused the liveliest interest. Although the original theory has been largely modified since the developmental history of a greater number of

forms has become known, comparisons such as these have thrown much light on the connections existing between various classes of animals, the extent to which developmental histories correspond being, in a degree, an index of relationships.

With a view primarily to increase the embryological evidences of evolution and at the same time to gain a clearer conception of relationships, the development of all the various types began to be traced from the original germ layers. Naturally the conditions which might influence development were considered, and explanations of how the mechanical action of simple physical factors, such as pressure, cohesion and gravity, might tend to cause a dividing egg of a given character to assume successively the various forms through which it passes during development, were soon advanced and received with great enthusiasm. To determine exactly how important a rôle these extrinsic factors play, and the extent to which the future form of an organism is predetermined by the intrinsic character of the egg is evidently of the greatest importance in the solution of the problem of heredity and constitutes at present one of the main problems of embryology.

Although the earlier embryologists were satisfied with simply tracing the origin of the various organs of the body from their primary germ layers which begin to be defined with the gastrula stage, nowadays the solution of the origin of every organ or feature of the body and the significance and factors of every step in development are sought by the most painstaking tracing of the history of every single cell arising by every succeeding division of the egg. It was with a purpose such as this that an elaborate and careful study of the development of *Crepidula* was undertaken by Prof. E. G. Conklin, of the University of Pennsylvania. This study has been followed by the author in constructing for the American Museum of Natural History the series of models described in the present paper.



THE SLIPPER LIMPET OR BOAT SHELL  
*Crepidula fornicata* Lamarck

#### THE DEVELOPMENT OF CREPIDULA.

The models represent on a greatly enlarged scale (about 400 diameters) the more important stages in the development of the egg of a gasteropod mollusk of the genus *Crepidula*—the Slipper Limpet, or Boat Shell—common on the coast of the United States. The exceedingly minute eggs (.182 mm. in diameter) are laid in great numbers in capsules secreted by the mollusk. These

capsules, to the number of 50 or 60, each containing about 250 eggs, are united into a grape-like cluster generally found under the shell of the *Crepidula* attached to the stone or other object upon which it lives its sedentary life. The total number of eggs laid at one time by an animal is about 13,000.

The unfertilized egg (Fig. a) is a nearly spherical single cell consisting of a very small amount of protoplasm surrounded by a relatively larger amount of yolk material, mostly in the form of small globules. Within the protoplasm, in a nearly central position, is found the nucleus of the cell. The whole egg is enveloped by a cell membrane.

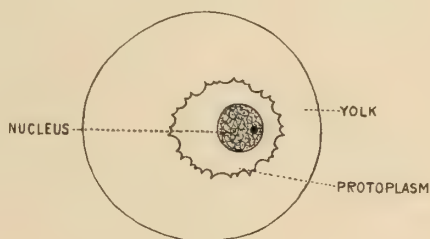


FIG. a

The first change which takes place in the egg, preparatory to development, is a migration of the nucleus and protoplasm from a central position toward the upper surface of the egg, the yolk, or deutoplasm, taking its position below it. The egg thus becomes distinctly symmetrical about a vertical axis (Fig. b). The upper pole, at which the protoplasm is found, is known as the *animal* pole; the opposite, or lower, as the *vegetative* pole, since

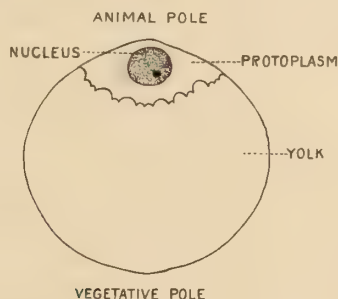
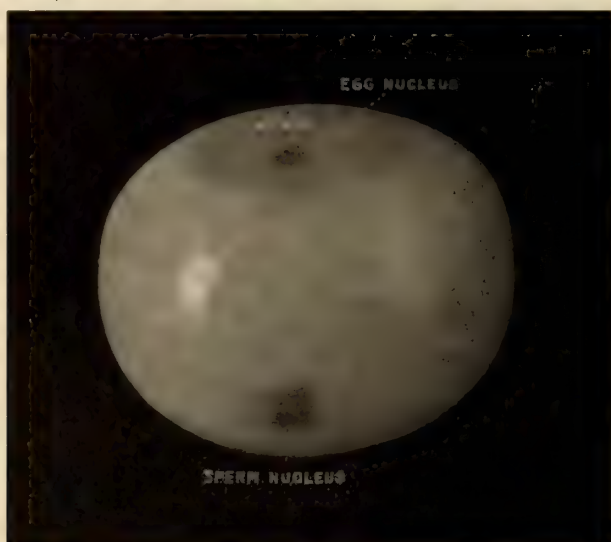


FIG. b



about this is collected the yolk or food material contained in the egg. This axis may be followed throughout the development and has been found to correspond to the dorso-ventral axis of the future larva.

About the time of the change in the position of the nucleus and protoplasm, a division of the former takes place. One of the portions resulting from this division, surrounded by a small amount of protoplasm, is extruded at the animal pole, where it remains for a time as a minute body. This is the "first polar



MODEL 1, A

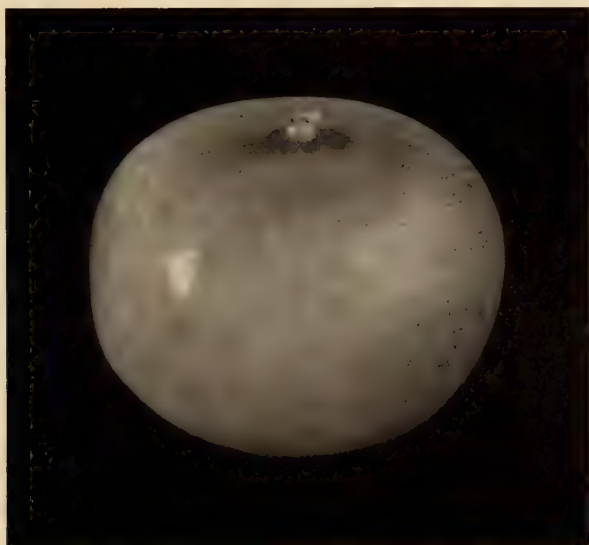
The individual egg showing the clear protoplasmic area above, under the two polar bodies; the yolk with the yolk globules below. In the protoplasm at the animal pole is seen the egg nucleus. The sperm nucleus is represented shortly after entering the lower half of the egg.

body" and is the larger of the two adherent bodies shown in Model 1, B.

This process of division of the nucleus is soon repeated, and a second smaller polar body is extruded. These two polar bodies remain in position for a considerable length of time. Although they do not take any part in the future development, becoming ultimately detached and lost, their elimination is of

particular significance in the preparation of the eggs for fertilization. The process is known as the "maturation" of the egg.

The sperm cells are inclosed with the ova in the capsules. They consist chiefly of a nucleus with a very insignificant amount of protoplasmic substance. A single sperm cell enters the ovum somewhere about the vegetative pole, at the time of the beginning of the maturation process, and its nucleus gradually makes its way upward toward the egg nucleus, until the two nuclei are in contact. These nuclei, known as the "pronuclei" of the egg, may be seen in Model 1, B lying close together in the protoplasm at the animal pole. The egg is now fertilized and capable of developing into a new organism.



MODEL 1, B

The fertilized egg, showing the egg and sperm nuclei in contact at the animal pole. On either side of them are the centrospheres.

Each nucleus is composed largely of a peculiar substance, which has been given the name "chromatin," because of the readiness with which it assumes the stains used for coloring microscopic objects. Though little is known about the definite function and properties of chromatin, its importance is evidently very great, for it is found in the nuclei of all cells. Generally it is

seen as small particles in the form of loops or bands, more or less compactly arranged, and of a definite number in any given species. To these the name "chromosomes" has been given. The division of a nucleus seems to consist mainly in a careful separation of the chromosomes into two equal parts.

There is also present in connection with each nucleus a small body which seems to be the center of all nuclear changes, the "centrosome." Whenever any activity of the nucleus such as a division takes place, the centrosome is in evidence.

Centrosomes are to be observed in both of the pronuclei of the undivided egg, and radiations apparently extend from them to each separate chromosome. The arrangement of the chromatin now becomes looser, and the chromosomes are more widely separated. The centrosomes come to lie in diametrically

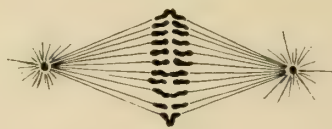
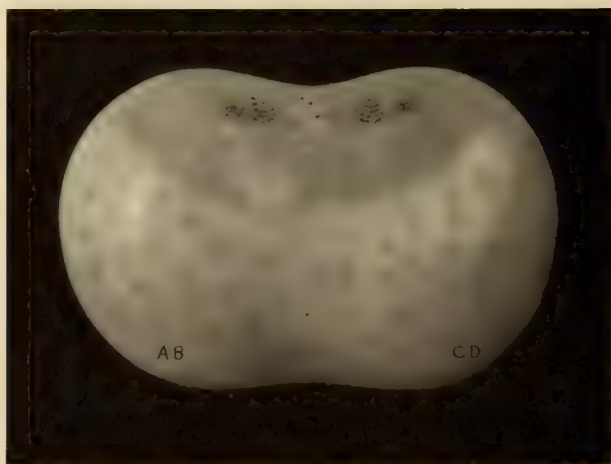


FIG. c

opposite positions with the two pronuclei between them. The nuclear boundaries next disappear, the chromosomes become



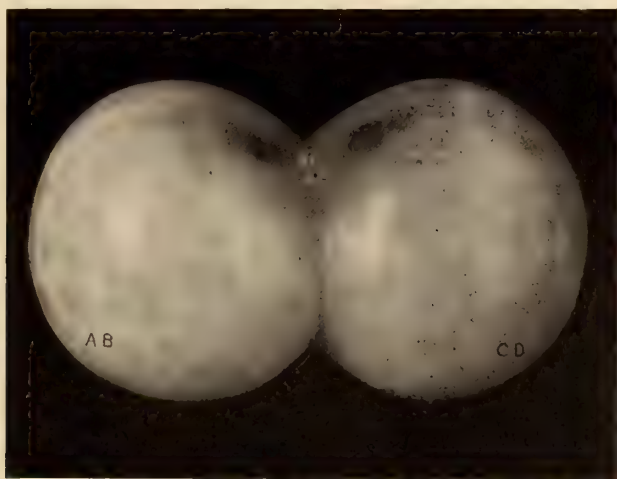
MODEL 2

First cleavage. Separation of chromosomes. Elongation and constriction of the egg preceding its complete division into two cells.

still farther separated, the radiations become more distinct, and soon seem to act on the chromosomes as two sets of fibers. The next step is a separation of every chromosome into two parts, which seem to be drawn in opposite directions toward the two centrosomes. These changes are shown in Model 2 and Fig. C.

In this manner two new nuclei are formed from the pronuclei, each new nucleus being composed of one-half of the chromatin of the male and female pronuclei, and each nucleus having a centrosome.

At the same time that the division of the pronuclei takes place a corresponding division of the whole egg occurs. The egg elongates (Model 2), a constriction takes place, and finally, coincident with the formation of the two new nuclei, there is



MODEL 3

Completion of first cleavage. Two cells. Polar bodies in the furrow between them. Daughter nuclei and centrospheres in each cell.

a complete separation of the egg into two halves, forming two new cells, each made up of protoplasm and yolk, like the single undivided egg, and each having a nucleus with its centrosome (Model 3). One of these two new cells gives rise to the anterior portion of the embryo, the other to the posterior.

Beginning with this, the first cleavage, up to the time when the larva is capable of taking in new food, the whole process of



MODEL 4

Resting stage after first cleavage. The two cells flattened against each other.



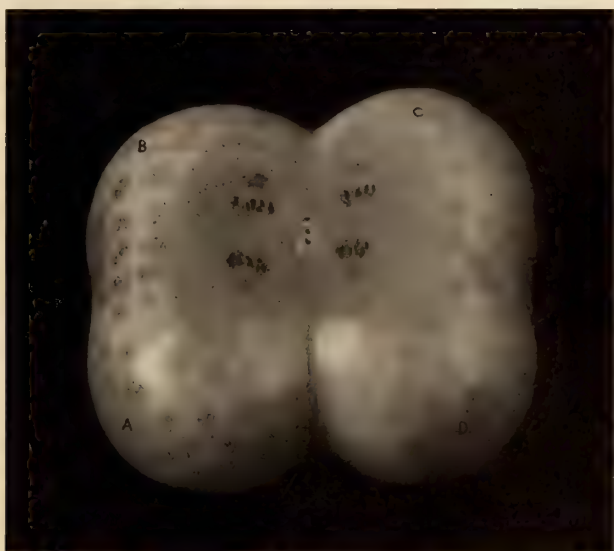
MODEL 5

Beginning of second cleavage. Nuclei resolved into division spindles. This model shows plainly two centrosomes, radiations and the two sets of chromosomes in each cell



development proceeds through the repeated subdivision of these cells.

The second cleavage, which occurs at right angles to the first, divides the egg and the body of the future larva into right and left halves. This cleavage, initiated by a division of the centrosome, takes place by the changes in each nucleus, followed by an elongation and constriction of the cell. Finally a complete division of each nucleus and each cell into two parts takes place (Models 5 and 6). This gives four new cells, Model 7, each

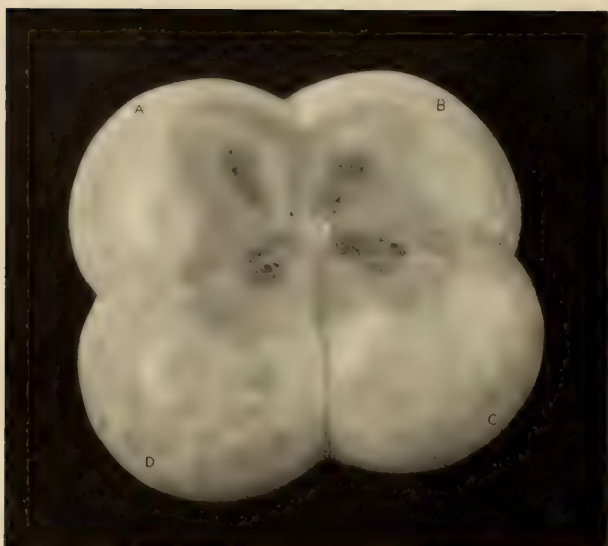


MODEL 6

Second cleavage. Further separation of chromosomes. The two cells elongated and showing a constriction.

destined to form a definite part of the future organism, but each constituted as far as we can see in a precisely similar manner.

In the next, the third, cleavage the division takes place in a new direction. This, as indicated by the nuclear figures on Model 8, is oblique. Instead of a division into two equal parts, only a portion of the protoplasmic substance at the animal pole separates off, giving rise to four small cells which eventually lie above and slightly to the right of the four lower larger cells. (Model 9 shows the eight cells resulting from this cleavage.)



MODEL 7

Second cleavage complete, so that four cells are formed.



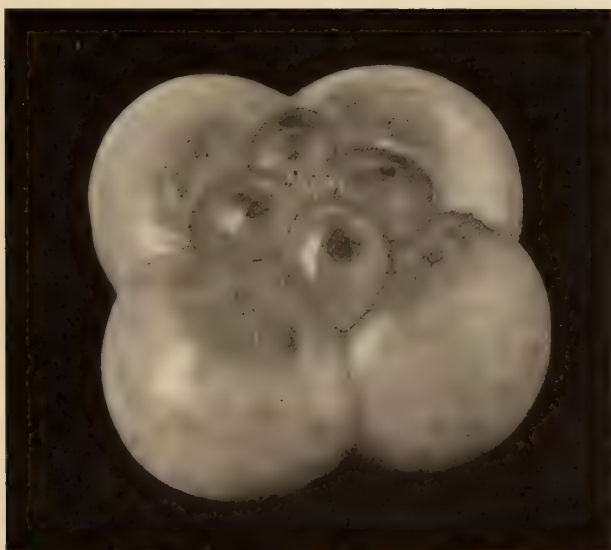
MODEL 8

Third cleavage. Division spindles radial. The raised surface at the inner end of each spindle indicates the point at which four new cells will be separated off.



MODEL 9

Third cleavage completed. First quartet of small cells or ectoblasts formed.



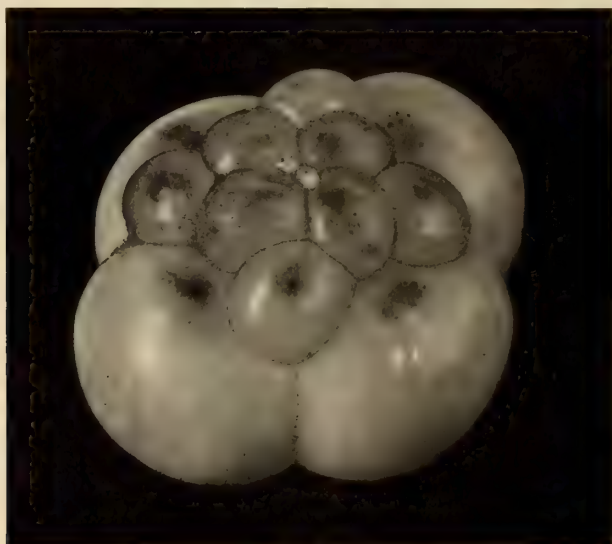
MODEL 10

Fourth cleavage begun.

The fourth cleavage (Model 10) is also oblique. It results in the separation of another quartet of small protoplasmic cells slightly to the left of the large yolk-laden cells and also at the animal pole (Model 11).

The fifth cleavage is simply a division of the first quartet of small cells (Model 12).

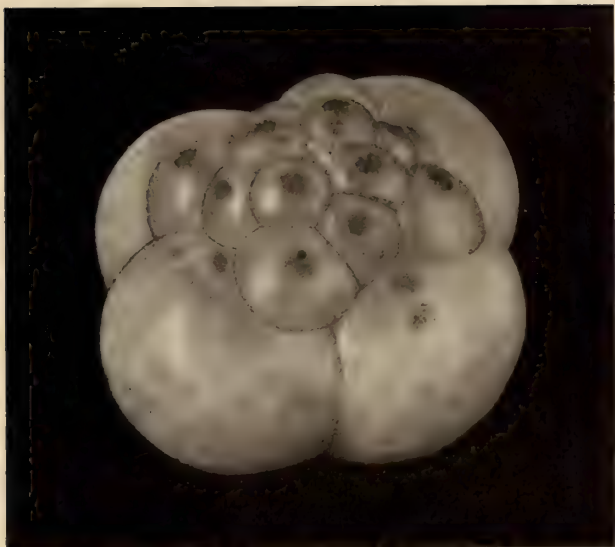
By the sixth cleavage, the beginning of which is shown in Model 12, a third and last quartet of similar small cells is given off at the animal pole. This cleavage also is oblique, but to the right. By this alternation in the direction of each cleavage



MODEL 11

Fourth cleavage completed. A second quartet of ectoblasts formed. Division beginning in cells of first quartet. Fifth cleavage begun.

plane, which began with first cleavage as indicated by the rotation of nuclei to the right, or in a clockwise direction on Model 4, the symmetrical arrangement of the cells is maintained. Lying at the animal pole of the egg, these three quartets of small cells form the so-called dorsal plate, which, by rapid multiplication of cells by division, is destined to grow until it completely covers the egg and forms the outer layer or ectoderm of the embryo. These cells are therefore known as "ectoblasts."



MODEL 12

Fifth cleavage completed. Sixth cleavage begun. Formation of third quartet of ectoblasts.



MODEL 13

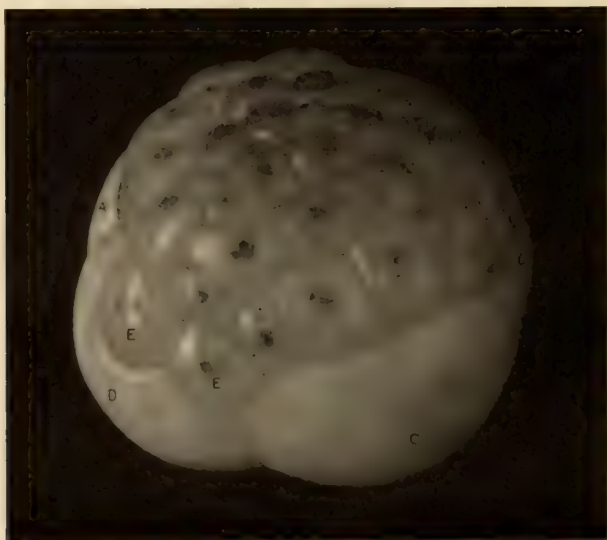
Sixth cleavage completed. Second quartet has also divided; separation of ectoblasts completed.





MODEL 14

Separation from the left posterior large cell (D) of a single cell, the mesentoblast (M-E).



MODEL 15

Division of mesentoblast. The number of ectoblast cells has increased by further division of the three quartets.

The seventh cleavage (Model 12) divides the second quartet of ectoblasts.

The eighth cleavage (Model 13) consists of a second division of the first quartet of ectoblasts.

The ninth cleavage is unique, only one rather large cell, the "mesentoblast," M.-E. being separated off from the left posterior of the larger cells (D, Model 14). This new cell divides into two (Model 15) and again into four parts (Model 16). The upper two of these four cells, concealed on the model by the rim of the dorsal plate, multiply rapidly by division, and the cells which are formed from them make their way between the dorsal plate of the ectoblasts and the large yolk-laden cells below. They will form the future middle layer or mesoderm of the embryo, and

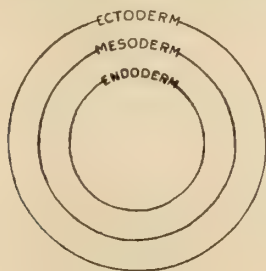


FIG. d

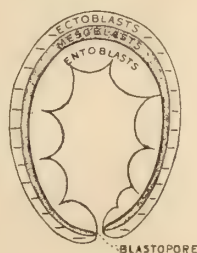
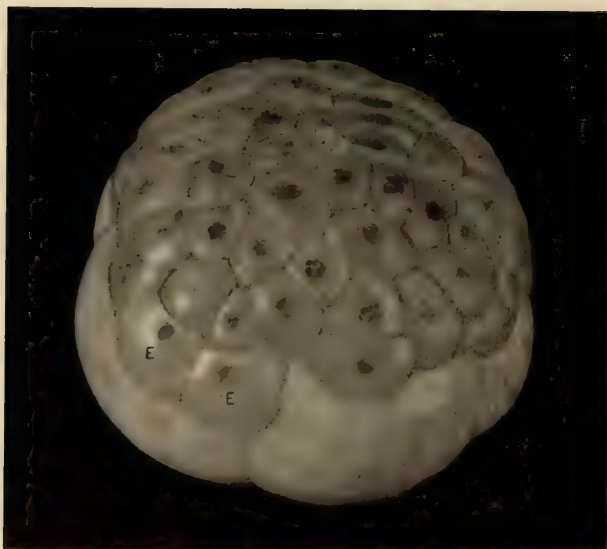


FIG. e

are known as the "mesoblasts." After the separation of the mesoblasts the remaining three large cells finally divide, giving in all eight or nine large inferior cells, the "entoblasts," which in time will form the inner layer of the embryo.

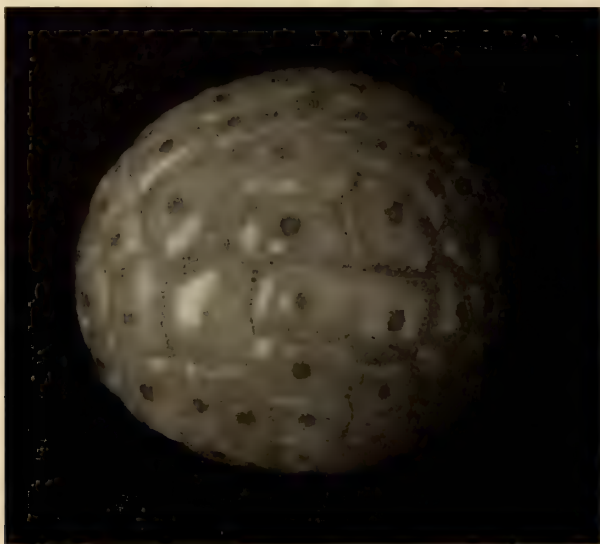
At an early stage there are thus separated in the egg the rudiments of the three layers distinguishable in the development of all higher animal organisms: ectoderm, mesoderm and endoderm. These may be diagrammatically represented as in Fig. d.

The ectoblasts by multiplication of cells soon extend over the entire ovum until only a narrow pore is left on the lower or ventral pole (Models 17, 18). Owing to the unequal rate of this growth, the upper or animal pole is at the same time shifted anteriorly till its angular distance from the lower vegetative pole becomes on this side only  $90^\circ$  (Model 18).



MODEL 16

Second division of mesentoblast, resulting in the formation of two mesoblasts and two entoblasts, which are concealed under the rim of the plate of ectoblasts, further divisions of ectoblast cell.



MODEL 17

Continued spreading of ectoblasts over the surface of the egg. Their origin from the three quartets is indicated in the model by colors: first quartet, red; second, blue; third, uncolored.

Immediately around the pore left by the closing of the edge of the ectoblasts is seen on this model the depression which indicates the beginning of the future mouth of the embryo. For a short time the pore itself is closed, but soon opens again and communication is thus established between the exterior and the internal cavity of the embryo. The structure of the embryo at this time may be represented diagrammatically as in Fig. *e*.



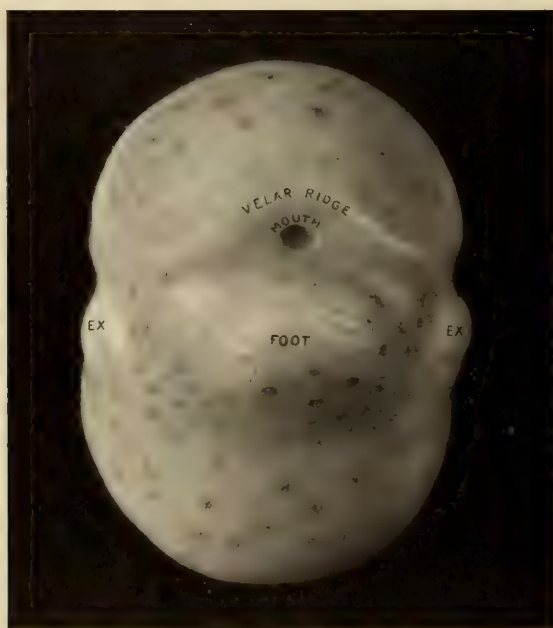
MODEL 18

The ectoblasts completely enclose the egg, leaving only a narrow pore (blastopore), about which is seen a depression. The derivation of ectoblasts from the three quartets indicated on the models by the coloring. The various regions of the future larva are becoming more sharply defined.

From this time on, the development consists of the differentiation by growth of the multiplying cells of these three separate layers into the specialized organs of the body.

The ectoderm cells which, as shown by the number of nuclei, are already very numerous, multiply rapidly in certain areas indicated by the slight outgrowths on the surface. These soon become more pronounced and form the beginning of the ectodermic organs of the embryo.

Above the mouth opening, which by this time is clearly defined, a ridge marks the beginning of the velum, or swimming organ, of the larva; below the mouth there is a large protuberance which will form the foot; at the sides of this two smaller knob-like outgrowths form the larval kidneys. At a point directly op-



MODEL 19

The larva begins to assume its definitive form. The mouth opening is formed; above it the curved edge of the velum is defined; below it the foot begins to protrude; on either side of this the first appearance of the larva kidney (EX) is indicated. At the lower pole of the model the shell gland is shown.

posite the apical, or head, end the shell gland develops (Model 18). Model 19 shows the shell beginning to be secreted by the shell gland.

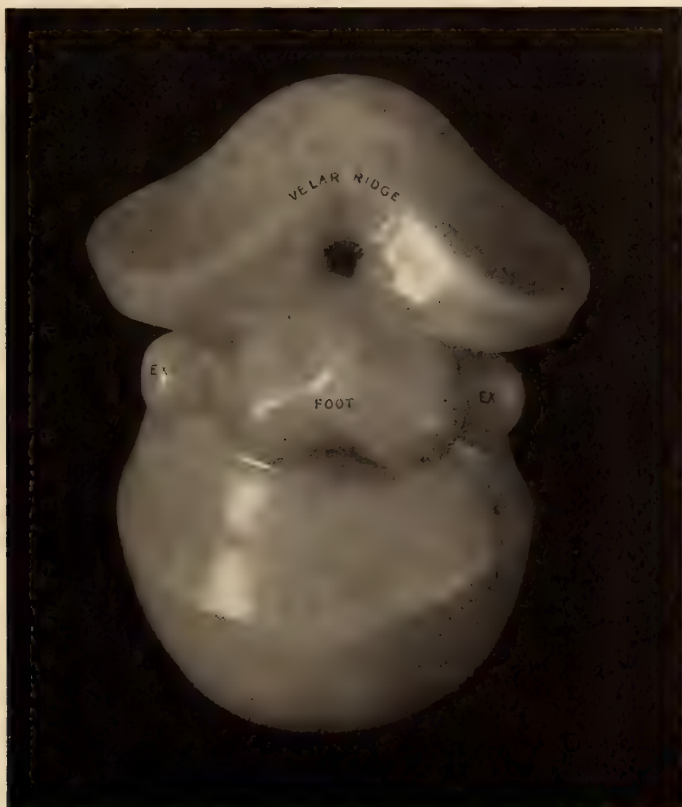
The entoblast cells of the cavity of the gastrula by a process of unequal growth rapidly go to form the various parts of the digestive tube: stomach, liver, intestine etc. The œsophagus is formed by an invagination of the ectoderm from the exterior.

The middle layer, the mesoblastic layer, forms the muscles,



the circulatory system, heart and blood-vessels and the supporting tissues of the body.

Coincident with this differentiation of the regions of the body into organs, a change in the direction of the antero-posterior axis of the embryo takes place. The whole posterior portion is



MODEL 20

The formation of the veliger larva has proceeded farther. The various external organs are well defined. Below is seen the shell secreted by the underlying cells of the shell gland.

pushed ventrally: the mouth opening and the whole apical pole are shifted forward, and there is a twisting of the entire axis, plainly seen in the bending of the intestine. This organ, which originally lay in the mid-ventral line, assumes the form of an almost complete loop (Model 22). The asymmetry of the

mollusk larva is thus established and the definitive asymmetry of the adult is foreshadowed.

Models 21 and 22 show the completed larva, the free-swim-



MODEL 21. SIDE VIEW

The mollusk larva, or the veliger, completed. The velum, or swimming organ, about the anterior end bears two rows of cilia. The foot is large and prominent and bears on its under surface the lid, or operculum, by which the opening of the shell is closed when the animal withdraws into it. On the head are seen the two eyes. The two raised points near these mark the position of the feelers or tentacles.

ming veliger with its fully formed ciliated velum, or swimming organ, the shell and the large foot, bearing on its lower surface the operculum, or lid, by means of which the shell is closed when

the animal withdraws into it. On the head are seen the two eyes and near them the tentacles.

The veliger stage, though more or less suppressed in land mollusks, is common to all gastropods. By an additional series of changes, consisting in a continued growth and development in certain directions, this larva is ultimately metamorphosed into the adult form of its species.



MODEL 22

A section of the veliger showing the internal anatomy.

## APPENDIX.

TECHNICAL DESCRIPTION OF THE MODELS.<sup>1</sup>

1. A. The ovum of *Crepidula* at the time of fertilization.

1. B. The fertilized ovum showing pronuclei lying in the cytoplasm at the animal pole. On either side of them the centrospheres. At the vegetative poles is seen the yolk-stalk. Jour. Morph., Vol. XIII, 1897, fig. 1.

2. First cleavage—appearance of first cleavage furrow. Jour. Morph., Vol. XIII, figs. 3, 4.

3. Completion of first cleavage furrow. Nuclei and asters opposite each other in the two blastomeres. Between the blastomeres are the polar bodies. Jour. Morph., Vol. XIII, fig. 5.

4. Resting stage after first cleavage. Flattening of blastomeres against each other. Dexiotropic turning of nuclei, asters and protoplasmic areas. Jour. Morph., Vol. XIII, fig. 6.

5. Beginning of second cleavage. Læotropic turning of spindles and protoplasmic areas. The centrospheres of preceding cleavage lie near the cleavage furrow. Jour. Morph., Vol. XIII, fig. 7.

6. Second cleavage. Beginning of second cleavage furrow. Læotropic rotation of spindles. Polar furrow being formed. Jour. Morph., Vol. XIII, fig. 9.

7. Completion of second cleavage. Asters nearly in position of poles of preceding spindles. Polar furrow well formed. Jour. Morph., Vol. XIII, fig. 10.

8. Third cleavage. Spindles almost radial, but showing slight dexiotropic rotation. Jour. Morph., Vol. XIII, fig. 12.

9. Third cleavage. Completion of first quartet. Position of asters shows that division was dexiotropic. Jour. Morph., Vol. XIII, fig. 13.

10. Fourth cleavage. Læotropic. First quartet has rotated into furrows between macromeres. Jour. Morph., Vol. XIII, fig. 14.

11. Fourth cleavage complete. Fifth cleavage, læotropic division of first quartet of micromeres and formation of "turret cells" (trochoblasts). Jour. Morph., Vol. XIII, fig. 16.

12. Fifth cleavage complete. Sixth cleavage dexiotropic. Formation of third and last quartet of ectomeres. Sixteen cells. Jour. Morph., Vol. XIII, fig. 17.

<sup>1</sup> The models correspond to the figures in "The Development of *Crepidula*," by Dr. E. G. Conklin, Jour. Morph., Vol. XIII, 1897, and "Karyokinesis and Cytokinesis," Jour. Acad. Nat. Sci., 2d Ser., Vol. XII, Phila., 1902.

13. Sixth cleavage complete. Division of second quartet complete. Quadrangular plate of ectomeres with angles of plate in furrows between macromeres. Twenty ectomeres (4 apical, 4 turret and 12 belt cells) and 4 macromeres. *Jour. Morph.*, Vol. XIII, figs. 19, 20.

14. Formation of first member of fourth quartet, the mesentoblast, from the left posterior macromere; formation of basal cells of cross by the second division of first quartet. *Jour. Morph.*, Vol. XIII, figs. 22, 23.

15. Division of the mesentoblast completed, dextrotropic. Second and third quartets. Turret cells formed. Forty-two cells: 4 apicals 8 cross, 4 turret, 20 belt cells, 2 mesentoblasts, 4 macromeres. *Jour. Morph.*, Vol. XIII, fig. 29.

16. Fourth quartet completed by laetotropic cleavage of macromeres, A, B and C. The two mesentoblasts of the preceding stage have divided, forming the two enteroblasts and two primary mesoblasts which lie immediately above the latter, but concealed by the plate of ectoblasts. *Jour. Morph.*, Vol. XIII, fig. 31.

17. Further division of ectoblasts. Expansion of arms a, b and c of ectoblastic cross into a cell plate. Anterior shifting of apical cells. Posterior turret cells undivided. Formation of quadrangular blastopores, the enteroblasts in posterior angle. *Jour. Morph.*, Vol. XIII, figs. 51, 52.

18. Later stage. Apex on ventral side, slightly to the right. Cells of ectoblastic cross, first quartet, cover the whole anterior end of embryo. Large cells of posterior arm, dorsal. The closing of the blastopore and a depression about it indicating the formation of the stomodæum. The superior rows of ectoblast cells of second quartet, directly above the blastopore, form the first and second velar rows. The shell gland is forming at the postero-dorsal and somewhat to the left. *Jour. Morph.*, Vol. XIII, figs. 65, 74, 75.

19. Older embryo, showing apical, posterior and pedal cell plates. On either side to the anterior and posterior of the dorsal cell plate, the velar rows are branching. Mouth and the external kidneys are formed, the shell gland expanding. *Jour. Morph.*, Vol. XIII, figs. 76 to 79.

20. Older stage-formation of velum and foot. The shell gland greatly expanded and forming the shell of the veliger. *Jour. Morph.*, Vol. XIII, figs. 80-82.

21. The fully formed veliger.

22. Section of the preceding.





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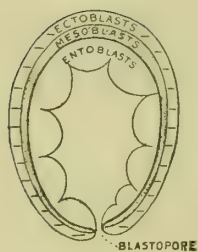
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AMERICAN MUSEUM OF NATURAL HISTORY

# The Birds of the Vicinity of New York City



BY

Frank M. Chapman

Associate Curator, Department of Mammalogy and Ornithology

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL

VOL. VI, Nos. 2 and 3, APRIL and JULY, 1906

Guide Leaflet No. 22

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The  
Birds of the Vicinity  
of  
New York City

A Guide to the Local Collection  
in the  
Department of Ornithology

By  
FRANK M. CHAPMAN  
Associate Curator of Mammalogy and Ornithology

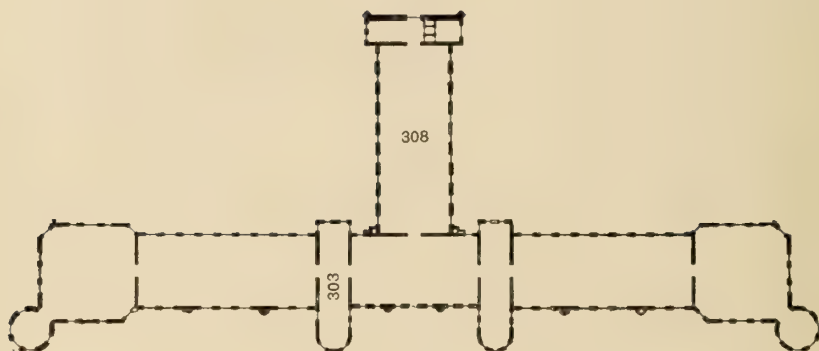
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THIRD, OR GALLERY FLOOR.

Key-plan of the Museum building, showing the location of the halls in which the specimens and groups may be found to which references are made in this Guide Leaflet. Some of the groups are in Hall No. 208 of the Second Floor, directly under Hall No. 308 of this plan.

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# THE BIRDS OF THE VICINITY OF NEW YORK CITY.<sup>1</sup>

BY FRANK M. CHAPMAN.

Associate Curator of Mammalogy and Ornithology.

## INTRODUCTION.

The collection which this Guide is intended to accompany has been formed especially to aid students in identifying the birds found in the vicinity of New York City. It occupies a portion of the West Corridor of the third floor (Hall No. 303). With a few exceptions, all the specimens contained in it were collected within 50 miles of the American Museum of Natural History. The species which we have as yet been unable to secure within these limits are represented temporarily by specimens from the North American Collection. The collection is placed under two heads: first, systematic, containing virtually all the birds which have been recorded from within the prescribed limits, and second, seasonal, in which only the birds of the month are exhibited, as is explained more fully beyond. Species of accidental occurrence, or those which have been found in this vicinity but once or twice, are grouped at the end of the systematic collection.

The birds are labeled in accordance with the system of nomenclature adopted by the American Ornithologists' Union. The number on the label, preceding the name of each species is its number in the Union's "Check-List" of North American birds (2nd edition, 1895). In the desk case in the center of the hall will be found a local collection of the nests and eggs of the birds which breed within 50 miles of the Museum. It is labeled on the same plan as the local collection of birds. Near by are placed photographs from nature of the nests of most of our breeding birds and exhibits of bills, feet, wings, tails and feathers designed to explain technical terms used in descriptive ornithology. A list of useful ornithological publications will also be found here.

<sup>1</sup> Reprinted from the *American Museum Journal*, Vol. VI, pp. 81-102, April, 1906.

The appended annotated list of the species known to occur within a radius of 50 miles of the Museum is based on information derived for the most part from four sources: (1) previously published records; (2) the author's notes covering a period of twenty years' intermittent observation, mainly at Englewood, N. J.; (3) the observations of Mr. Waldron DeWitt Miller at Plainfield, N. J.; and (4) information received from Mr. William Dutcher. For many years Mr. Dutcher has made a specialty of the study of Long Island birds and has brought together a vast amount of data concerning them.

As a matter of local interest an asterisk (\*) has been placed before those species which have been observed in Central Park. This list of Park birds is based on published records, the author's observations and information received from Messrs. C. G. Abbott, S. H. Chubb and B. S. Bowdish.

The text cuts with which this Guide is illustrated, with the exception of the Starling, are from Coues's "Key to North American Birds." For their use the Museum is indebted to Messrs. Dana Estes and Company, the publishers of that work. The full page plates are from photographs of Museum exhibits.

The region embraced within our limits possesses natural advantages calculated to attract a great number of birds. Our sea-coast, with its sandy beaches and shallow bays; our rivers, creeks and ponds, with their surrounding grassy marshes; our wooded hillsides and valleys; our rolling uplands and fertile meadows, offer haunts suited to the wants of most birds. Again, our coast-line and the Hudson River valley form natural highways of migration regularly followed by birds in their journeys to and from their summer homes.

The exceptional abundance of birds in this vicinity, however, is not due alone to the varied character of the country, or to the fact that twice each year streams of migrants pass along our coasts and through our valleys. There are certain causes which tend to limit the ranges of animals, chief among which is temperature. A study of the ranges or habitats of animals and plants shows that the boundaries of the areas inhabited by many species coincide with one another and also to a greater or less extent with lines of equal temperature. The ranges of these species being thus governed by natural causes, they are taken as indices of the limits of faunas or natural life-areas. The

lines between these faunas cannot, of course, be sharply drawn. The change from one to another is gradual, and between the two a neutral strip exists in which will be found species characteristic of each. Just such a condition is found in this vicinity, the northern boundary of the Carolinian Fauna over-lapping the southern boundary of the Alleghanian Fauna in the valleys of the Delaware, Hudson and Connecticut. In other words, we have here on the one hand a number of birds which are found no farther north and on the other certain species which are found no farther south; that is, in the breeding season, for among birds only the nesting ranges are of value in determining the boundaries of faunas.

The southern limit of the Carolinian Fauna on the Atlantic Coast is near Norfolk, Virginia; its northern limit, on the coast, as said above, is in the vicinity of New York City. To be more exact, a careful study of the nesting ranges of certain species shows that the most northern points at which they are regularly found is Port Jervis in the Delaware valley, Fishkill in the Hudson River valley, and Portland in the Connecticut River valley. These localities then may be considered as defining the northern limits of the Carolinian Fauna in the valleys in which they are placed. In the more elevated country between these points it is doubtful if the limits of the fauna reach quite as far north, for river valleys, both because they offer a natural pathway for the extension of a bird's range, and because of the higher temperature prevailing in them, tend to carry northward the boundaries of faunas. Eastward, along the Connecticut shore, the Carolinian Fauna may reach the mouth of the Thames. Long Island, although farther south, belongs for the most part in the Alleghanian rather than the Carolinian Fauna. Numbers of species common and even abundant in the Lower Hudson valley are exceedingly rare on Long Island, especially on the southern shore. But along the northern shore, or older part of the island, where deciduous trees abound, there is an evident trace of the Carolinian Fauna shown by the regular occurrence of the Blue-winged Warbler and the Acadian Flycatcher.

The following Carolinian birds are found every summer within 50 miles of the Museum, and all but two or three are known to nest regularly here. Their occurrence as breeding birds northward beyond these limits is, with but few exceptions, rare and irregular.

Clapper Rail.	Blue-winged Warbler.
King Rail.	Louisiana Water-Thrush.
Turkey Vulture.	Kentucky Warbler.
Barn Owl.	Hooded Warbler.
Acadian Flycatcher.	Mockingbird.
Fish Crow.	Carolina Wren.
Cardinal.	Tufted Titmouse.
Rough-winged Swallow.	Carolina Chickadee.
Worm-eating Warbler.	Blue-gray Gnatcatcher.

The southern limit of the Alleghanian Fauna on the coast is less clearly defined. It includes, however, Long Island and northern New Jersey. Its boundaries may be determined by the presence in the breeding season of the following species, few of which are known to nest at sea-level south of our limits:

Carolina Rail.	Purple Finch.
Alder Flycatcher.	Golden-winged Warbler.
Least Flycatcher.	Nashville Warbler.
Bobolink.	Chestnut-sided Warbler.
Savanna Sparrow.	Black-throated Green Warbler.
Rose-breasted Grosbeak.	Wilson's Thrush.

Thus it will be seen that while the region south of our district has the Carolinian species mentioned, and the region to the northward has the Alleghanian species just given, we, in this intermediate strip, have both Carolinian and Alleghanian species.

It is evident, therefore, that from an ornithological standpoint we are most favorably situated, and a comparison of the number of birds found within our limits with the numbers recorded from other districts shows that the causes mentioned have been effective in giving us an unusually rich avifauna. Due allowance must of course be made for the much greater area included in all but one of the regions used in comparison.

Recorded from within 50 Miles of New York City	. . .	353
" " District Columbia (Richmond, MS.)	. . .	281
" " Ontario, Canada, (McIlwraith)	. . .	316
" " Massachusetts (Howe and Allen)	. . .	362
" " Illinois (Ridgway)	. . .	352
" " Indiana (Butler)	. . .	305
" " Michigan (Cook)	. . .	332
" " Kansas (Goss)	. . .	343

During the course of a year the bird-life of our vicinity is subject to great changes. Some birds are always with us, some come for the summer, others pass us in the spring and fall in traveling to and from their more northern homes, and others still come



only in the winter. Our birds may thus be arranged, according to the season when they are present, in several rather well-defined groups, for which the following names seem most applicable.

**I. Permanent Residents.**—This class includes species which are with us throughout the year, but it does not follow that the same individuals pass the entire year here. Comparatively few, indeed, of the species in this group are permanent residents in the strict sense of the term. The Bob-white, Ruffed Grouse, and several of the Owls are doubtless literally permanent residents, that is, the same individuals pass their lives in one restricted locality, but it is not probable that the Bluebirds, for example, found here during the winter are the same birds which nested with us in the summer. Doubtless our winter Bluebirds pass the summer farther north, while our summer Bluebirds winter farther south but as a species, the Bluebird is a permanent resident.

*List of Permanent Residents.*

Bob-white.	Blue Jay.
Ruffed Grouse.	American Crow.
Marsh Hawk.	Fish Crow.
Sharp-shinned Hawk.	Starling.
Cooper's Hawk.	Meadowlark.
Red-tailed Hawk.	House Sparrow.
Red-shouldered Hawk.	Purple Finch.
Broad-winged Hawk.	American Goldfinch.
Bald Eagle.	European Goldfinch.
Duck Hawk.	Song Sparrow.
Sparrow Hawk.	Swamp Sparrow.
Long-eared Owl.	Cardinal.
Barred Owl.	Cedar Waxwing.
Screech Owl.	Carolina Wren.
Great Horned Owl.	White-breasted Nuthatch.
Hairy Woodpecker.	Tufted Titmouse.
Downy Woodpecker.	Chicadee.
Flicker.	Robin.
	Bluebird.

**II. Summer Residents.**—Summer residents, as the name implies, are birds found here during the summer. They may, however, arrive early in March and remain until December, as do the Blackbirds and the Woodcocks, or they may not come until May and may leave us in August. Summer residents, then, are birds which come to us at varying times in the spring and after nesting here return to more southern winter resorts in the fall.

*List of Summer Residents.*

Wood Duck.	Henslow's Sparrow.
American Bittern.	Sharp-tailed Sparrow.
Least Bittern.	Seaside Sparrow.
Green Heron.	Chipping Sparrow.
Black-crowned Night Heron.	Field Sparrow.
King Rail.	Towhee.
Clapper Rail.	Rose-breasted Grosbeak.
Virginia Rail.	Indigo Bunting.
Sora.	Scarlet Tanager.
Yellow Rail.	Purple Martin.
Black Rail.	Cliff Swallow.
Woodcock.	Barn Swallow.
Bartramian Sandpiper.	Tree Swallow.
Spotted Sandpiper.	Bank Swallow.
Killdeer.	Rough-winged Swallow.
Piping Plover.	Red-eyed Vireo.
Mourning Dove.	Warbling Vireo.
Osprey.	Yellow-throated Vireo.
Barn Owl.	White-eyed Vireo.
Yellow-billed Cuckoo.	Black and White Warbler.
Black-billed Cuckoo.	Worm-eating Warbler.
Belted Kingfisher.	Blue-winged Warbler.
Red-headed Woodpecker.	Golden-winged Warbler.
Whip-poor-will.	Parula Warbler.
Nighthawk.	Yellow Warbler.
Chimney Swift.	Chestnut-sided Warbler.
Ruby-throated Hummingbird.	Black-throated green Warbler.
Kingbird.	Pine Warbler.
Crested Flycatcher.	Prairie Warbler.
Phoebe.	Ovenbird.
Wood Pewee.	Louisiana Water-Thrush.
Acadian Flycatcher.	Kentucky Warbler.
Alder Flycatcher.	Maryland Yellow-throat.
Least Flycatcher.	Yellow-breasted Chat.
Bobolink.	Hooded Warbler.
Cowbird.	Redstart.
Red-winged Blackbird.	Catbird.
Orchard Oriole.	Brown Thrasher.
Baltimore Oriole.	House Wren.
Purple Grackle.	Short-billed Marsh Wren.
Vesper Sparrow.	Long-billed Marsh Wren.
Savanna Sparrow.	Wood Thrush.
Grasshopper Sparrow.	Wilson's Thrush.

**III. Summer Visitors.**—Comparatively few birds fall into this group. As a rule the northern limit of their breeding range is not far south of our southern boundaries and they sometimes

visit us in small numbers, generally after their breeding season is over. In this group may also be placed the Shearwaters and Petrels, some of which are known to nest in the Antarctic Regions during our winter. In the spring they migrate northward and pass the summer off our coasts.

*List of Summer Visitants.*

Gull-billed Tern.	American Egret.
Royal Tern.	Little Blue Heron.
Forster's Tern.	Wilson's Plover.
Sooty Tern.	Oyster-catcher.
Black Skimmer.	Turkey Vulture.
Greater Shearwater.	Red-bellied Woodpecker.
Audubon's Shearwater.	Summer Tanager.
Sooty Shearwater.	Carolina Chickadee.
Wilson's Petrel.	Blue-gray Gnatcatcher.

Mockingbird.

**IV. Winter Residents.**—Winter residents, like summer residents, may arrive long before and remain long after the season which gives them their name. Our Junco, or Snowbird, for example, comes from the north in September and remains until April, but is a typical winter resident. That is, it arrives in the fall and after passing the entire winter with us returns to its more northern summer home in the spring.

*List of Winter Residents.*

Holbøll's Grebe.	Rough-legged Hawk.
Horned Grebe.	Saw-whet Owl.
Loon.	Horned Lark.
Red-throated Loon.	Prairie Horned Lark.
Razor-billed Auk.	American Crossbill.
Kittiwake Gull.	Redpoll.
Glaucous Gull.	Pine Siskin.
Great Black-backed Gull.	Snowflake.
Herring Gull.	Lapland Longspur.
Ring-billed Gull.	Ipswich Sparrow.
Green-winged Teal.	White-throated Sparrow.
American Golden-eye.	Tree Sparrow.
Buffle-head.	Junco.
Old-Squaw.	Northern Shrike.
King Eider.	Myrtle Warbler.
American Scoter.	Winter Wren.
White-winged Scoter.	Brown Creeper.
Surf Scoter.	Canadian Nuthatch.
Purple Sandpiper.	Golden-crowned Kinglet.

**V. Winter Visitants.**—Winter visitants are birds which may or may not visit us during the winter. As a rule, their presence

depends upon the severity of the winter. An unusually severe season sometimes forces boreal birds southward and they then may be found in numbers south of their regular winter range.

*List of Winter Visitants.*

Puffin.	American Eider.
Black Guillemot.	Goshawk.
Brunnich's Murre.	Black Gyrfalcon. (?)
Dovekie.	Hawk Owl.
Iceland Gull.	Snowy Owl.
Kumlien's Gull.	Evening Grosbeak.
Cormorant.	Pine Grosbeak.
Harlequin Duck.	White-winged Crossbill.

Holboell's Redpoll.

**VI. Regular Transient Visitants.**—The birds of this class are found here only during the migrations. Their summer homes are north of us, their winter homes are south of us, and we see them only when they pass northward on their spring migration and southward on their fall migration.

*List of Regular Transient Visitants.*

Pied-billed Grebe.	Tennessee Warbler.
Pomarine Jaeger.	Cape May Warbler.
Parasitic Jaeger.	Black-throated Blue Warbler.
Long-tailed Jaeger.	Dowitcher.
Laughing Gull.	Long-billed Dowitcher.
Bonaparte's Gull.	Stilt Sandpiper.
Common Tern.	Knot.
Roseate Tern.	Pectoral Sandpiper.
Caspian Tern.	White-rumped Sandpiper.
Cory's Shearwater.	Least Sandpiper.
Leach's Petrel.	Red-backed Sandpiper.
Gannet.	Semipalmated Sandpiper.
Double-crested Cormorant.	Western Sandpiper.
Red-breasted Merganser.	Sanderling.
Hooded Merganser.	Greater Yellow-legs.
Black Duck.	Yellow-legs.
Blue-winged Teal.	Solitary Sandpiper.
Pintail.	Willet.
Redhead.	Hudsonian Curlew.
American Scaup Duck.	Black-bellied Plover.
Lesser Scaup Duck.	Golden Plover.
Ruddy Duck.	Semipalmated Plover.
Canada Goose.	Turnstone.
Brant.	Pigeon Hawk.
Great Blue Heron.	Short-eared Owl.
Florida Gallinule.	Yellow-bellied Woodpecker.
Coot.	Magnolia Warbler.
Red Phalarope.	Bay-breasted Warbler.

Northern Phalarope.	Black-poll Warbler.
Wilson's Snipe.	Blackburnian Warbler.
Olive-sided Flycatcher.	Palm Warbler.
Yellow-bellied Flycatcher.	Yellow Palm Warbler.
Rusty Blackbird.	Water-Thrush.
Bronzed Grackle.	Connecticut Warbler.
Nelson's Sharp-tailed Sparrow.	Mourning Warbler.
Acadian Sharp-tailed Sparrow.	Wilson's Warbler.
White-crowned Sparrow.	Canadian Warbler.
Lincoln's Sparrow.	Titlark.
Fox Sparrow.	Ruby-crowned Kinglet.
Philadelphia Vireo.	Gray-cheeked Thrush.
Blue-headed Vireo.	Bicknell's Thrush.
Nashville Warbler.	Swainson's Thrush.

Hermit Thrush.

**VII. Irregular Transient Visitants.**—These birds occur irregularly during the migrations. With certain exceptions they are birds of the interior and breed in the northern United States and British Provinces. Their regular line of migration is down the Mississippi Valley, and their occurrence on the Atlantic coast is more or less infrequent. Here are also included species formerly common near New York, but now practically extinct within our limits, where, however, they are sometimes found.

*List of Irregular Transient Visitants.*

Least Tern.	Whistling Swan.
Black Tern.	Wilson's Phalarope.
Mallard.	American Avocet.
Gadwall.	Baird's Sandpiper.
American Widgeon.	Marbled Godwit.
Shoveller.	Hudsonian Godwit.
Canvasback.	Buff-breasted Sandpiper.
Ring-necked Duck.	Long-billed Curlew.
Greater Snow Goose.	Eskimo Curlew.
Blue Goose.	Passenger Pigeon.
American White-fronted Goose.	Golden Eagle.
Hutchins's Goose.	Migrant Shrike.
Black Brant.	Orange-crowned Warbler.

Grinnell's Water-Thrush.

**VIII. Accidental Visitants.**—The homes of the birds included in this class are so far removed from our boundaries that their presence here at any time can be considered only as purely accidental. In most cases it is doubtless due to the agency of storms or high winds which drive migrating birds from their course. One-fourth the number given below are Old World birds, and about one-half the total number have been found here but once.



*List of Accidental Vistants.*

Black-throated Loon.	Ground Dove.
Ivory Gull.	Black Vulture.
Little Gull.	Swallow-tailed Kite.
Sabine's Gull.	Swainson's Hawk.
Fulmar.	White Gyrfalcon.
Booby.	Great Gray Owl.
White Pelican.	Red-cockaded Woodpecker.
Brown Pelican.	Pileated Woodpecker.
European Widgeon.	Arkansas Kingbird.
European Green-winged Teal.	Raven.
Rufous-crested Duck.	Chestnut-collared Longspur.
Barnacle Goose.	Lark Sparrow.
White Ibis.	Blue Grosbeak.
Glossy Ibis.	Painted Bunting.
Snowy Heron.	Dickcissel.
Yellow-crowned Night Heron.	Louisiana Tanager.
Corn Crake.	Bohemian Waxwing.
Purple Gallinule.	Prothonotary Warbler.
Black-necked Stilt.	Cerulean Warbler.
European Woodcock.	Yellow-throated Warbler.
Curlew Sandpiper.	Townsend's Solitaire.
Ruff.	Varied Thrush.
Lapwing.	Wheatear.

*Summary.*

Permanent Residents . . . . .	34
Summer Residents . . . . .	86
Summer Visitants . . . . .	19
Winter Residents . . . . .	38
Winter Visitants . . . . .	17
Regular Transient Visitants . . . . .	86
Irregular Transient Visitants . . . . .	27
Accidental Visitants . . . . .	46
Total,	353

## THE SEASONAL COLLECTION.

The preceding seasonal analysis of our avifauna shows that only a part of the 353 birds which have been recorded from this vicinity are present at one time, and any arrangement of specimens which will, for example, show only the birds of a given month, will of course greatly simplify the problem of identification by excluding from it all species which, for seasonal reasons, we should not expect to find during the month in question.

The Seasonal Collection is made up of the Permanent Residents (Cases Q and O) and Migrants (Case P) and is changed



BLACK DUCK  
Group, Hall No. 208



each month. Thus, in February, it is composed of the ever-present Permanent Residents together with the migrants which have come from the north to spend the winter. In March, the March migrants from the south are added, and a month later those which may be expected to arrive in April are included. In due time the winter birds are withdrawn and the transient migrants removed, until in June, the collection consists of the Permanent Residents and birds which have come from the south to spend the summer. A similar treatment is continued throughout the year and the collection always, therefore, represents the bird-life of the month in which it is seen.

The following outline of the bird-life of the year explains more fully the manner in which this Seasonal Collection is arranged, and at the same time, it may be used as a reference check-list in the study of local migration. It should be understood that the dates given represent those of a climatically normal year and that only the commoner water birds are included.

**January Bird-Life.**—Probably during no other month is there less movement among our birds than in January. The regular winter visitants have come; the fall migrants which may have lingered until December have gone, and the earliest spring migrants will not arrive before the latter part of February or in early March. In fact, January is the only month in the year in which, as a rule, some birds do not arrive or depart. This rule, however, may be broken by such irregular birds as the Pine Grosbeak and the Redpoll, and, south of New York, the Snowflake and the Crossbill, birds which may be wholly absent some winters and abundant others.

The only birds usually to be found in January, therefore, are the permanent residents and the regular winter visitants. Singing, mating, nesting, molting, migrating, events which in their season play so important a part in a bird's life, do not concern the birds of January. With them food is the one important question, and their movements at this season are governed solely by the food supply. Snow may fall and winds blow, but as long as the birds find enough to eat they give small heed to the weather. Food, therefore, rather than temperature, is the most important factor in a bird's life at this season.

BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Winter Residents, see page 87.*

**February Bird-Life.**—The conditions prevailing in the bird

world during January will be practically unchanged until the latter part of February. Then, should there be a period of mild weather, we may expect to hear the Song Sparrows and Bluebirds inaugurate the season of song. An unusually warm day earlier in the month may have tempted either or both of these birds prematurely to welcome spring, but as a rule we do not hear them until late in February, and then only under favorable conditions.

The songs of these birds bid us keep watch for the earlier migrants, the Robin, the Purple Grackle and the Red-winged Blackbird, birds which pass the winter such a short distance south of us that they appear at the first sign of returning spring. Further confidence in the growth of the new year is shown by the Great Horned Owl, one of our less common species, which begins nesting late in February or early in March.

In spite of these movements among the birds, February is, generally speaking, a winter month, and it is only in exceptional years that we find much change in our bird-life.

BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Winter Residents, see page 87.*

*Migrants arriving from the South.*

February 15 to 28, in favorable seasons.

Purple Grackle,

Red-winged Blackbird.

Rusty Blackbird.

Robin.

**March Bird-Life.**—Although March is sure to witness a general northward movement among the birds, the date of their arrival is as uncertain as the weather of the month itself. Continued severe weather prevents an advance, which a higher temperature occasions. It is well, therefore, to watch the weather predictions, since birds will quickly follow in the wake of a warm wave.

When the ice leaves our bays, ponds and rivers, Ducks and Geese will appear. Even before this event, the Grackles, Red-winged Blackbirds and Robins will come in flocks and in song, and singing will become general with the Song Sparrows and Bluebirds, whose numbers will be greatly increased. When successive thaws have rendered the earth soft enough for the Woodcock's probe, we may expect to find him in favorable localities searching for his fare of earthworms. With the advent of insects, we may look for their enemy the Phoebe, and Meadowlarks, Cowbirds and other March Migrants may be found.

The weather which hastens the arrival of birds from the



South, also prompts certain of our Winter Visitants to begin their northward journey, and after March we do not often see Redpolls, Snowflakes or Northern Shrikes.

## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Winter Residents, see page 87.*

*Winter Residents leaving for the North.*

Horned Lark.

Snowflake.

Redpoll.

Pine Grosbeak.

Northern Shrike.

*Migrants arriving from the South.*

Appearing when the ice leaves the bays and rivers.

Loon.

Green-winged Teal.

Pintail.

Blue-winged Teal.

Mallard.

Canada Goose.

March 1 to 10.

Purple Grackle.

Rusty Blackbird.

Red-winged Blackbird.

Robin.

March 10 to 20.

Woodcock.

Meadowlark.

Phoebe.

Cowbird.

Fox Sparrow.

March 20 to 31.

Wilson's Snipe.

Mourning Dove.

Kingfisher.

Swamp Sparrow.

White-throated Sparrow.

**April Bird-Life.**—In early April the developments in the vegetable world, which the most casual observer cannot fail to see, are accompanied by corresponding but less noticed activities in the world of birds. The appearance of the skunk-cabbage, the blossoming of the pussy-willow and the early wild flowers soon become common knowledge; but the arrival of the Vesper, Field and Chipping Sparrows, of Tree Swallows, Myrtle Warblers and Hermit Thrushes, is known to comparatively few. Still, to the bird-lover, the return of these feathered friends is of even greater interest than the blossoming of trees and plants.

The migratory movement grows rapidly in strength, and during the latter part of the month one may expect to see newcomers almost daily. It will be noted that the earlier migrants of the month are all seed-eaters, while the later are certain insectivorous birds which catch their prey in the air, for example, Swallows, Swifts and Nighthawks.

## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Winter Residents, see page 87.*

*Winter Residents leaving for the North.*

Junco.	Brown Creeper.
Tree Sparrow.	Red-breasted Nuthatch.
Winter Wren.	Golden-crowned Kinglet.

*Migrants arriving from the South.*

April 1 to 10.

Pied-billed Grebe.	Field Sparrow.
Great Blue Heron.	Chipping Sparrow.
Black-crowned Night Heron.	Tree Swallow.
Osprey.	Myrtle Warbler.
Vesper Sparrow.	American Pipit.
Savanna Sparrow.	Hermit Thrush.

April 10 to 20.

American Bittern.	Barn Swallow.
Green Heron.	Yellow Palm Warbler.
Clapper Rail.	Pine Warbler.
Yellow-bellied Sapsucker.	Louisiana Water-Thrush.

Ruby-crowned Kinglet.

April 20 to 30.

Spotted Sandpiper.	Purple Martin.
Semipalmated Sandpiper.	Cliff Swallow.
Whip-poor-will.	Bank Swallow.
Chimney Swift.	Rough-winged Swallow.
Least Flycatcher.	Black and White Warbler.
Towhee.	Black-throated Green Warbler.
Blue-headed Vireo.	Brown Thrasher.

**May Bird-Life.**—As the season advances, marked changes in temperature are less likely to occur, and the migration becomes regular and continuous. In February and March there may be two weeks or more variation in the times of arrival of the same species in different years; in May we expect to find a given species within a day or two of a certain date. We shall, nevertheless, find the force of the migratory current still closely dependent on the weather, and under the encouragement of a high temperature we may be visited by "bird waves," flooding the woods with migrants. Birds are then doubtless more abundant than at any other season. As many as ten species may be noted as arriving on the same day, and sixty or seventy species may be observed within a few hours.

After May 15, birds begin to decrease in number, the Transient Visitants passing farther north, and by June 5 we have only Permanent Residents and Summer Residents.

## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.**Summer Residents, see page 86.*

*Migrants arriving from the South.*

May 1 to 10.

Common Tern.	White-eyed Vireo.
Solitary Sandpiper.	Nashville Warbler.
Semipalmated Plover.	Blue-winged Warbler.
Yellow-billed Cuckoo.	Parula Warbler.
Black-billed Cuckoo.	Black-throated Blue Warbler.
Nighthawk.	Magnolia Warbler.
Ruby-throated Hummingbird.	Yellow-breasted Chat.
Crested Flycatcher.	Chestnut-sided Warbler.
Kingbird.	Prairie Warbler.
Baltimore Oriole.	Small-billed Water-Thrush.
Orchard Oriole.	Hooded Warbler.
Bobolink.	Yellow Warbler.
Grasshopper Sparrow.	Maryland Yellowthroat.
Indigo Bunting.	Oven-bird.
Rose-breasted Grosbeak.	Redstart.
Scarlet Tanager.	House Wren.
Red-eyed Vireo.	Catbird.
Warbling Vireo.	Wood Thrush.
Yellow-throated Vireo.	Veery.

May 10 to 20.

Wood Pewee.	Black-poll Warbler.
Acadian Flycatcher.	Wilson's Warbler.
Yellow-bellied Flycatcher.	Canadian Warbler.
White-crowned Sparrow.	Long-billed Marsh Wren.
Golden-winged Warbler.	Short-billed Marsh Wren.
Tennessee Warbler.	Olive-backed Thrush.
Worm-eating Warbler.	Gray-cheeked Thrush.
Cape May Warbler.	Alder Flycatcher.
Blackburnian Warbler.	Mourning Warbler.
Bay-breasted Warbler.	Bicknell's Thrush.

**June Bird-Life.**—After June 5 we may be reasonably sure that, with a few exceptions, every bird seen has or has had a nest in this vicinity. Several of the birds which began nesting in April will rear second broods in June, while the young of other April-nesting birds may not leave the nest until June. All the birds that began nesting in May will still be occupied with household affairs in June, and when we add to these the late-breeding species that wait for June before settling their domestic arrangements, it will be seen that among birds June is the home month of the year.

Nest-building, egg-laying, incubating and the care of the young now make constant and exceptional demands on birds which, in response, exhibit traits which at other times of the year they give no evidence of possessing. Singing now reaches its highest

development, and certain call-notes are heard only at this season. The numberless actions incident to courtship, the intelligence displayed in nest-building, the choice of special food for the young, the devotion which prompts the parents recklessly to expose themselves in protecting their offspring,—all these manifestations of the bird-mind may be observed in June.

BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Summer Residents, see page 86.*

**July Bird-Life.**—The full development of the bird year is attained in June, and as early as the first week in July the season begins to wane, when, among some migratory birds, there are evidences of preparation for the journey southward.

The young of certain species which rear but one brood a year have now left the nest, and, accompanied by the parents, wander about the country. In localities which we had thoroughly explored in June, we may now find species not met with then. In some cases these families join others of their kind, forming small flocks, the nuclei of the great gathering seen later. Examples are Grackles, Red-winged Blackbirds and Tree Swallows. The last named increase rapidly in number, and by July 10 we may see them flying over late each afternoon *en route* to their roosts in the Hackensack marshes.

During the first week in the month we shall also find that certain birds have concluded their season of song. Bobolinks and Red-winged Blackbirds are rarely heard after the 10th of the month; their young are reared, the cares of nesting-time are passed, and with other one-brooded birds they begin to renew their worn breeding plumages by molting. After the 15th we miss the voices of the Veery, Orchard and Baltimore Orioles, Chat, Brown Thrasher and other birds.

BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Summer Residents, see page 86.*

**August Bird-Life.**—With the majority of our nesting birds, family cares are ended in August, and at this season they completely renew their worn plumages by molting. When molting, birds are less in evidence than at any other time. What becomes of many of our birds in August it is difficult to say. Baltimore Orioles, for example, are rarely seen from August 1 to 20, but after the latter date they reappear clad in full plumage, and they are then in nearly full

song. So apparently complete is the disappearance of birds in August, that before the fall migration brings new arrivals daily from the north, one may spend hours in the woods and hear only the Red-eyed Vireo and the Wood Pewee, August's own songsters.

Late in the month, migrants from the north travel through the woods in small companies, but the characteristic bird-life of August is in the marshes. There the Swallows come in increasing numbers to their roosts in the reeds, while Red-winged Blackbirds and Bobolinks, under the alias of Reedbird, are abundant where the wild rice grows.

## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Summer Residents, see page 86.*

*Migrants arriving from the North.*

August 1 to 15.

Sora.	Golden-winged Warbler.
Semipalmated Sandpiper.	Chestnut-sided Warbler.
Semipalmated Plover.	Canadian Warbler.
Yellow-bellied Flycatcher.	Small-billed Water-Thrush.

August 15 to 31.

Olive-sided Flycatcher.	Black-throated Green Warbler.
Tennessee Warbler.	Black-throated Blue Warbler.
Nashville Warbler.	Magnolia Warbler.
Parula Warbler.	Blackburnian Warbler.
Cape May Warbler.	Wilson's Warbler.

Red-breasted Nuthatch.

**September Bird-Life.**—The student whose patience has been sorely tried by the comparative scarcity of birds in August will find that in September his observations in the field will be attended by far more interesting results. The first marked fall in the temperature is sure to be followed by a flight of migrants which, like the "bird waves" of May, will flood the woods with birds. By far the larger number will be Warblers; indeed, September, like May, is characterized by the abundance of these small birds.

Birds of the year will outnumber the adults, and in most cases their plumage will be quite unlike that worn by their parents in May. In many instances, even the adults themselves appear in a changed dress. As a rule, fall plumages are less striking than those of spring, and when, in addition, it is remembered that birds are not in song, and that the foliage is much denser, the greater difficulty of identifying birds in the field will be appreciated.

About September 25 our more common Winter Visitants arrive from the north, but afterward birds decrease rapidly in number.



## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.**Summer Residents, see page 86.**Summer Residents leaving for the South.*

September 1 to 10.

Acadian Flycatcher.

Rough-winged Swallow.

Orchard Oriole.

Worm-eating Warbler.

Blue-winged Warbler.

September 10 to 20.

Baltimore Oriole.

Yellow Warbler.

Purple Martin.

Yellow-breasted Chat.

September 20 to 30.

Common Tern.

Rose-breasted Grosbeak.

Green Heron.

Yellow-throated Vireo.

Hummingbird.

Warbling Vireo.

Kingbird.

Hooded Warbler.

Crested Flycatcher.

Louisiana Water-Thrush.

Wood Pewee.

Veery.

*Migrants arriving from the North.*

September 1 to 10.

Lincoln's Sparrow.

Black-poll Warbler.

Connecticut Warbler.

September 10 to 20.

Wilson's Snipe.

Olive-backed Thrush.

Blue-headed Vireo.

Bicknell's Thrush.

September 20 to 30.

Herring Gull.

Myrtle Warbler.

Green-winged Teal.

Yellow Palm Warbler.

Blue-winged Teal.

Brown Creeper.

American Coot.

Golden-crowned Kinglet.

Junco.

Ruby-crowned Kinglet.

White-throated Sparrow.

Winter Wren.

White-crowned Sparrow.

Gray-cheeked Thrush.

**October Bird-Life.**—Early October generally brings the first killing frost, depriving insectivorous birds of a large part of their food and forcing them to journey southward. Flycatchers, Warblers, Vireos and Swallows now take their departure, and after the 15th of the month few insect-eating birds remain, except those which, like Woodpeckers, feed on insect's eggs or larvæ.

This is the season of Sparrows. In countless numbers they throng old stubble, potato and corn fields, doing untold good by destroying the seeds of noxious weeds. With these birds will be the lately arrived Juncos, Tree Sparrows and Fox Sparrows. When disturbed, all seek shelter in the nearest hedgerow, and their mingled notes produce a twittering chorus in which it is difficult to distinguish the voices of individual birds.

This, however, will not be the only bird music of the month. Certain species now have a brief second song period, and on the brighter days of the month we may hear Song, White-throated and Fox Sparrows, Phœbes and Ruby-crowned Kinglets singing.

## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Summer Residents, see page 86.*

*Summer Residents leaving for the South.*

October 1 to 10.

Black-crowned Night Heron.	Scarlet Tanager.
Yellow-billed Cuckoo.	Cliff Swallow.
Black-billed Cuckoo.	Barn Swallow.
Chimney Swift.	Bank Swallow.
Least Flycatcher.	White-eyed Vireo.
Bobolink.	Black and White Warbler.
Grasshopper Sparrow.	Oven-bird.
Indigo Bunting.	Redstart.

Wood Thrush.

October 10 to 20.

Spotted Sandpiper.	Catbird.
Whip-poor-will.	Brown Thrasher.
Nighthawk.	House Wren.
Red-eyed Vireo.	Short-billed Marsh Wren.
Maryland Yellowthroat.	Long-billed Marsh Wren.

October 20 to 31.

Pied-billed Grebe.	Towhee.
Phœbe.	Tree Swallow.

*Migrants arriving from the North.*

October 1 to 10.

Loon.	Bronzed Grackle.
Pintail.	Rusty Blackbird.
Mallard.	American Pipit.
Canada Goose.	Hermit Thrush.

October 10 to 20.

Fox Sparrow.

October 20 to 31.

Horned Lark.	Snowflake.
Pine Finch.	Redpoll.
Tree Sparrow.	Northern Shrike.

**November Bird-Life.**—It is an interesting fact that the last migrants to leave in the fall are the first to arrive in the spring. The bird-life of November, when the fall migration is practically concluded closely resembles, therefore, that of March, when spring migration is inaugurated. The reason for this similarity is to be found in the fact that both months furnish birds with essentially the same kind of food. Thus the Loon, Grebes, Ducks, Geese and

Kingfisher remain until the forming of ice in November or early December deprives them of food and forces them to seek open water: while Woodcock and Snipe linger until they can no longer probe the frost-hardened earth. The thaws of March, however, will bring all these birds back to us by restoring their food. Certain Sparrows stay with us until the weed-bearing seeds on which they feed are covered by snow, when they are compelled to retreat farther southward, only to return, however, when the March sun lays bare the earth. Few birds' songs are heard in November. In some sheltered spot Song and White-throated Sparrows may continue in voice, but the characteristic bird-note of the month is the scatter-call or fall whistle of Bob-White.

## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Migrants leaving for the South.*

Wood Duck.	Cowbird.
American Bittern.	Red-winged Blackbird
Great Blue Heron.	Purple Grackle.
Woodcock.	Vesper Sparrow.
Mourning Dove.	Chipping Sparrow.
Belted Kingfisher.	Field Sparrow.
	Swamp Sparrow.

**December Bird-Life.**—The character of the bird-life of December depends largely upon the mildness or severity of the season. Should the ponds and streams remain open, the ground be unfrozen and little or no snow fall, many of the migrant species of November will linger into December.

The comparative scarcity of food now forces birds to forage actively for provisions, and when a supply is found, they are apt to remain until it is exhausted. Their wanderings in search of food lead them over large areas, and our dooryards and orchards may often be visited by species which, when food is more abundant, do not leave their woodland haunts. An excellent means of attracting them is to provide suitable food. Crumbs and seeds scattered in some place where they will not be covered by snow or blown away will bring Juncos and Tree Sparrows: an old seed-filled sunflower head may prove a feast for Goldfinches, while bits of meat, suet or ham bone hung from a tree will be eagerly welcomed by Chickadees, Nuthatches and Downy Woodpeckers.

## BIRDS OF THE MONTH.

*Permanent Residents, see page 85.*

*Winter Residents, see page 88.*

LIST OF BIRDS FOUND WITHIN FIFTY MILES OF THE AMERICAN  
MUSEUM OF NATURAL HISTORY, NEW YORK CITY.<sup>1</sup>

ORDER PYGOPODES. DIVING BIRDS.

FAMILY COLYMBIDÆ. GREBES.

**Holbæll's Grebe** (*Colymbus Holbælli*). A rather uncommon spring and fall migrant and less common winter resident.

**Horned Grebe** (*Colymbus auritus*). A common spring and fall migrant and not uncommon winter resident.

**\*Pied-billed Grebe; Diedapper; Dabchick; Hell Diver** (*Podilymbus podiceps*). Occurs chiefly as a migrant. In northern New Jersey and the Lower Hudson Valley it is common, but on Long Island is of "comparatively rare and infrequent occurrence" (Dutcher, MS). During favorable seasons a few pass the winter here. I know of no definite instance of its breeding. (See group, second floor of Museum).

FAMILY GAVIIDÆ. LOONS.

**Loon** (*Gavia imber*). A common migrant and less common winter resident. (See group, second floor).

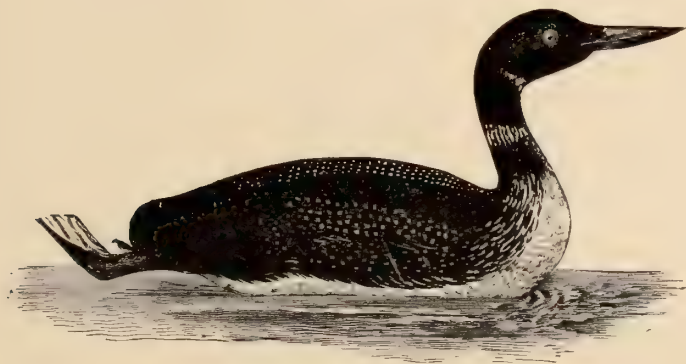


FIG. 1. LOON.

**Black-throated Loon** (*Gavia arctica*). Breeds in the far north, migrating southward to southern Canada. The only record of its occurrence near New York is based on an adult male (Coll. Am. Mus. No. 64,610) taken April 29, 1893, between Sands Point and Execution Lighthouse, L. I. (Dutcher, Auk, X, 1893, p. 265).

**Red-throated Loon** (*Gavia lumme*). A not uncommon winter resident, but more frequently found during the migrations.

<sup>1</sup> Issued also in separate form as **Guide Leaflet, No. 22.**

## FAMILY ALCIDÆ. AUKS, MURRES AND PUFFINS.

**Puffin** (*Fratercula arctica*). There is but one recent record of its occurrence, December 15, 1882, Center Moriches, L. I. (Dutcher, Auk, V, 1888, p. 171).

**Black Guillemot** (*Cepphus grylle*). Breeds from the Bay of Fundy northward; in winter migrates southward, regularly to Massachusetts. It has been found but once in Connecticut (Stony Creek, Dec. 1887.—Sage, Auk, VII, 1890, p. 283), and the only Long Island record, given by Lawrence, is apparently based on a specimen in the Lawrence Collection labeled "Long Island" (Coll. Am. Mus. No. 64,614).

**Brünnich's Murre** (*Uria lomvia*). Breeds from the Magdalen Islands northward; in winter migrates southward as far as New Jersey. On the western end of Long Island it is as a rule uncommon; at the eastern end it occurs more frequently, but is irregular (Dutcher, Auk, II, 1885, p. 38). During some seasons, however, the bird becomes common in our waters (Averill, Auk, VIII, 1891, p. 307). Giraud's record of "*Uria troile*" doubtless refers to this species. Specimens in the Lawrence Collection originally labeled "*U. troile*" are *U. lomvia*. Records of the occurrence of this species on Long Island during the winter are given by Braislin (Auk, XX, 1903, p. 51).

**Razor-billed Auk** (*Alca torda*). Breeds from the Magdalen Islands northward; in winter migrates southward, regularly to Long Island and rarely to Virginia and North Carolina.

**Dovekie** (*Alle alle*). A species of the far north, migrating southward in winter, more or less regularly to New Jersey. With us its numbers vary during different winters. It is considered by Dutcher to be generally a rare bird on Long Island (Abst. Linn. Soc. No. 4, 1892, p. 6), but is given by Scott as a regular winter visitant on the New Jersey coast (Bull. Nutt. Orn. Club, IV, 1879, p. 228).

## ORDER LONGIPENNES. LONG-WINGED SWIMMERS.

## FAMILY STERCORARIIDÆ. SKUAS AND JÆGERS.

**Pomarine Jæger** (*Stercorarius pomarinus*). Passes the nesting season chiefly within the Arctic Circle and migrates southward from July to late October, during which period it is sometimes not uncommon off our coast, its presence depending largely on the abundance of the small fish on which it feeds (Baird, Auk, IV, 1887, p. 71).

**Parasitic Jæger** (*Stercorarius parasiticus*). Occurs off the coast in this vicinity as a regular migrant with the preceding species.

**Long-tailed Jæger** (*Stercorarius longicaudus*). During its migration it is sometimes not uncommon off our coast.

## FAMILY LARIDÆ. GULLS AND TERNS.

**Ivory Gull** (*Pagophila alba*). A boreal species of which there appears to be but one record, that of an adult taken at Sayville, L. I., January 5, 1893 (Dutcher, Auk, XII, 1895, p. 250).



**Kittiwake Gull** (*Rissa tridactyla*). A common late fall transient visitant and a comparatively rare winter resident, occurring generally some distance off-shore (Dutcher, MS).

**Glaucous Gull; Burgomaster** (*Larus glaucus*). Several specimens have been killed on the Lower Hudson River, and off Long Island it is found regularly in small numbers (Dutcher, MS).

**Iceland Gull** (*Larus leucopterus*). A northern species of which but one valid record exists for this vicinity, Rye, N. Y. March 3, 1894 (Porter, Auk, XII, 1895, p. 76; see also Dwight, Auk, XXIII, 1906, p. 37, where a second specimen reported by Porter, and incorrectly recorded by Chapman as *leucopterus*, is given as *L. kumlieni*).

**Kumlien Gull** (*Larus kumlieni*). There are two records of this rare Gull for this vicinity, one is based on an immature male shot March 8, 1898, at Rockaway Beach, L. I. (Braislin, Auk, XVI, 1899, p. 190 and XXII, 1905, p. 168, where the specimen is definitely identified), the other an immature female taken February 16, 1894, at Stamford, Conn. (Porter, Auk, 1895, p. 76; see also Dwight, Auk, XXIII, 1906, p. 37, where this specimen incorrectly identified by Chapman is re-determined).

**Great Black-backed Gull** (*Larus marinus*). A regular winter resident not uncommon along the coast, but rarely ascending our rivers.

**\*Herring Gull** (*Larus argentatus*). This is the common winter Gull of our harbor and coast. It arrives from the north in September and is abundant until April. The adults are pearl gray; the immature birds, or young born the previous summer, are grayish brown. There has been an evident increase in the numbers of this species since certain of its breeding grounds have been protected. Braislin states that non-breeding birds are now common on the south shore of Long Island during the summer (Auk, XXII, 1905, p. 168).

**Ring-billed Gull** (*Larus delawarensis*). A rather uncommon spring and fall migrant and winter resident (Dutcher, MS). Braislin (Auk, XXII, 1905, p. 168) states that this species is not uncommon on Long Island in the summer, that it occurs in large numbers in October, but that he has no record later than November 17.

**Laughing Gull** (*Larus atricilla*). Formerly a common summer resident on Long Island, but now known to nest only on Great South Bay, where it is rare. (See group, second floor).

**Bonaparte's Gull** (*Larus philadelphia*). A regular spring and fall migrant, sometimes seen in winter.

**Little Gull** (*Larus minutus*). This is a European species; the only satisfactory records of its occurrence in North America are those of immature birds taken on Fire Island, Long Island, September 15, 1887 (Dutcher, Auk, V, 1888, p. 172), and Rockaway Beach, L. I., May 10, 1902 (Braislin, Auk, XX, 1903, p. 52).

**Sabine's Gull** (*Xema sabinii*). A circumpolar species breeding in the Far North and rarely coming as far south as northern United States. Giraud records a specimen shot at Raynor South, Long Island, "July, 1837."

**Gull-billed Tern** (*Gelochelidon nilotica*). A southern species breeding as far north as Virginia, and wandering occasionally to Maine. There are several Long Island records, the most recent being two specimens taken at South Oyster Bay, July 4, 1882 (Dutcher, Auk, I, 1884, p. 34), and one shot from a flock of five on Shinnecock Bay, July 8, 1884 (Dutcher, Auk, II, 1885, p. 38).

**Caspian Tern** (*Sterna caspia*). A rather uncommon fall migrant. There appears to be but one spring record, that of two adult males taken at Amityville, L. I., May 12, 1898 (Braislin, Auk, XVI, 1899, p. 191).

**Royal Tern** (*Sterna maxima*). There is but one instance of its occurrence on Long Island, a specimen taken at Raynor South, August 27, 1831, by J. F. Ward (Am. Mus. No. 46,008, Lawrence Coll.).

**Forster's Tern** (*Sterna Forsteri*). More common in the interior than on the Atlantic coast, where it is not known to breed north of Virginia. It wanders irregularly northward and is sometimes found in this vicinity.

**Common Tern; Sea Swallow** (*Sterna hirundo*). Inhabits the greater part of the Northern Hemisphere; in North America breeds locally from the Arctic regions to the Gulf of Mexico. This was formerly an abundant bird along our coasts, but the relentless persecutions of millinery collectors have so reduced its numbers that it is now found in only a few isolated localities. Not many years ago it bred more or less commonly all along the Long Island coast, but until recently almost the only surviving large colony inhabited Big Gull Island. Even in this remote locality it was constantly persecuted by nest-robbing fishermen and egg collectors. Through the efforts of a number of bird-lovers, who raised a sum of money for the purpose, permission was obtained from the Lighthouse Board to have the lightkeeper on Little Gull Island appointed a special game-keeper to protect the Terns on Big Gull Island. The birds rapidly increased under this guardianship, but the subsequent use, by the United States Government, of Gull Island for the erection of fortifications has caused the Terns to abandon it. Colonies are now found at both the northern and southern ends of Gardiner's Island.

**Roseate Tern** (*Sterna dougalli*). "Temperate and tropical regions." In north America formerly breeding along the Atlantic coast northward irregularly to Maine; now rare north of southern New Jersey. A few pairs lived on Big Gull Island with the colony of Common Terns above mentioned, but I have not observed the species in either of the Gardiner's Island colonies.

**The Arctic Tern** (*Sterna paradisæa*) is included by Lawrence without remark. I know of no record of its occurrence near New York City, and Mr. Dutcher has but one specimen from Long Island, a male taken on Ram Island Shoals, July 1, 1884.

**Least Tern** (*Sterna antillarum*). Formerly a common summer resident in suitable places on the coasts in this vicinity, but now occurs only as a rare migrant.

**Sooty Tern** (*Sterna fuliginosa*). A southern species, not breeding north of North Carolina, but occasionally straying farther up the coast. It has been recorded from Lake Ronkonkoma, L. I. (Dutcher, Auk, III, 1886, p. 433), and Highland Falls, N. Y. (Mearns, Bull. Essex. Inst. XII, 1879, 87).

**Black Tern** (*Hydrochelidon nigra surinamensis*). A species of the interior, breeding from Kansas and Illinois to Alaska. Occurs on the Atlantic coast as an irregular migrant, usually in the fall, sometimes in considerable numbers.



FIG. 2. TERN.

#### FAMILY RYNCHOPIDÆ. SKIMMERS.

**Black Skimmer** (*Rynchops nigra*). A southern species, not breeding north of Maryland, but occasionally wandering up the coast after the breeding season. There are several records of its occurrence on Long Island during the summer.

#### ORDER TUBINARES. TUBE-NOSED SWIMMERS.

##### FAMILY PROCELLARIIDÆ. FULMARS AND SHEARWATERS.

**Fulmar** (*Fulmarus glacialis*). An arctic species which sometimes wanders southward to Massachusetts. One was found in an exhausted condition at Ridgewood, New Jersey, December, 1892, after a storm (Hales, Orn. and Oöl., XVII, 1892, p. 39).

**Cory's Shearwater** (*Puffinus borealis*). A pelagic species, sometimes not uncommon off our coasts from August to November. It has been recorded from Amagansett (Dutcher, Auk, V, 1883, p. 5), to Cape Cod, Massachusetts, but doubtless occurs along our coast to the southward. Braislin records two specimens shot off Fire Island Inlet, October 4, 1902 (Auk, XXI, 1904, p. 287).

**Greater Shearwater** (*Puffinus gravis*). A pelagic species, found on the Atlantic Ocean from Cape Horn to Greenland. Its breeding place is unknown. It appears off our coasts in early June and is irregularly common until November.

**Audubon's Shearwater** (*Puffinus lherminieri*). A southern species, breeding in the Bahamas and Bermudas, and rarely wandering northward to Long Island (Dutcher, Auk, V, 1888, p. 173).

**Sooty Shearwater** (*Puffinus griseus*). Known from the North Atlantic southward to South Carolina. It is found off our coasts associated with the Greater Shearwater, but is much less common.

**The Stormy Petrel** (*Procellaria pelagica*) is included by Lawrence in his "Catalogue of Birds Observed on New York Island" etc., but the record is not accompanied by data, nor is there a specimen of the bird from this vicinity in the Lawrence Collection.

**Leach's Petrel** (*Oceanodroma leucorhoa*). Breeds from Maine northward, and in the winter ranges southward to Virginia. It is rather uncommon in this vicinity.

**Wilson's Petrel** (*Oceanites oceanicus*). Nests in the islands of the Southern Seas (Kerguelen Island) in January and February and migrates northward after the breeding season, reaching the waters of our coasts in May and remaining until late September. It sometimes enters the Lower Bay of New York harbor in numbers.



FIG. 3. PETREL.

## ORDER STEGANOPODES. TOTIPALMATE SWIMMERS.

### FAMILY SULIDÆ. GANNETS.

**Booby** (*Sula leucogaster*). Coasts and islands of tropical and sub-tropical America, north of Georgia. Accidental on Moriches Bay, L. I. (Dutcher, Auk, X, 1893, p. 270).

**Gannet** (*Sula bassana*). A spring and fall migrant, usually occurring well off shore.

FAMILY PHALACROCORACIDÆ. CORMORANTS.

**Cormorant** (*Phalacrocorax carbo*). It is not common south of Maine, and is rare in this vicinity.

**Double-crested Cormorant** (*Phalacrocorax auritus*). A common spring and fall migrant.

FAMILY PELECANIDÆ. PELICANS

**White Pelican** (*Pelecanus erythrorhynchos*). Now rare or accidental on the Atlantic coast. Two specimens have been taken in this vicinity, one at Canarsie Bay, L. I. (Dutcher, Auk, X, 1893, p. 270), the other, a male, at Roslyn, May 11, 1885 (Forest and Stream, XXIV, 1885, p. 328).

**Brown Pelican** (*Pelecanus occidentalis*). Breeds as far north as South Carolina and occasionally strays up the coast as far as Massachusetts. DeKay records a specimen from Sandy Hook.

ORDER ANSERES. LAMELLIROSTRAL SWIMMERS.

FAMILY ANATIDÆ. DUCKS, GEESE AND SWANS.

**American Merganser; Sheldrake** (*Merganser americanus*). Not common from November to April.

**Red-breasted Merganser; Sheldrake** (*Merganser serrator*). On Long Island it is a very common spring and fall migrant (Dutcher, MS).

**Hooded Merganser** (*Lophodytes cucullatus*). A not common migrant and occasional winter visitant.

**Mallard** (*Anas boschas*). An irregular transient visitant, occurring in spring, winter and fall.

**\*Black Duck** (*Anas obscura*). Breeds from New Jersey to Labrador and winters from Massachusetts southward. It formerly nested in this vicinity, but now is found chiefly as a migrant, and less commonly in the winter. It still nests at some points on the Jersey coast and in a few localities on Long Island, (Dutcher, MS). (See group, second floor).

The Red-legged Black Duck, a supposed race of the Black Duck has been recorded from Long Island by Braislin (Auk, XXI, 288), but the status of this form is as yet too unsettled to make it desirable definitely to introduce it here.

**Gadwall** (*Chaulelasmus streperus*). A very rare migrant in this vicinity.

**European Widgeon** (*Mareca penelope*). An Old World species which occurs rarely on our coast. It has been taken at Leonia, N. J. (Chapman, Auk, VI, 1889, p. 302).



**Baldpate; American Widgeon** (*Marca americana*). An irregular transient visitant.

**European Green-winged Teal** (*Nettion crecca*). An Old World species of rare occurrence on our coasts. It is recorded from Trenton, N. J. (Abbott, Geology of New Jersey, 1868, p. 792), Hartford, Conn. (Treat, Auk, VIII, 1891, p. 112), and from Merrick, L. I., where two specimens were captured in December, 1900 (Braislin, Auk, XIX, 1902, p. 145).

**Green-winged Teal** (*Nettion carolinensis*). A rather uncommon spring and fall migrant and winter resident.



FIG. 4. MALLARDS.

**Blue-winged Teal** (*Querquedula discors*). A not common spring and common fall migrant.

**Shoveller; Spoonbill** (*Spatula clypeata*). A rare and irregular transient visitant.

**Pintail; Sprigtail** (*Dafla acuta*). A common migrant.

**\*Wood Duck; Summer Duck** (*Aix sponsa*). The Wood Duck is a rare summer resident on some of our more retired, wooded streams and becomes more common during the migrations.

The Rufous-crested Duck (*Netta rufina*) is an Old World species which is known as North American only from one specimen found in Fulton Market, New York City, and supposed to have been shot on Long Island.

**Redhead** (*Aythya americana*). On Long Island this species occurs as a regular migrant, in varying numbers, and is occasionally found in the winter (Dutcher, MS).

**Canvasback** (*Aythya vallisneria*). Occurs here as a not common migrant.

**American Scaup Duck**; **Broad-bill**; **Blue-bill**; **Black-head**; **Raft Duck** (*Aythya marila*). The commonest Duck of our bays, where it is sometimes seen in great numbers. It appears from the north about October 1 and remains until its feeding grounds are frozen over, returning as soon as the ice breaks in the early spring.

**Lesser Scaup Duck**; **Little Blue-bill**; **Creek Broadbill**; **Raft Duck** (*Aythya affinis*). Not as common as the preceding, with which its range in the main agrees.

**Ring-necked Duck** (*Aythya collaris*). North America, breeding only in the interior from Iowa northward. It is here a very rare, irregular transient visitant. The last record is that of Braislin (Auk, XVI, 1899, p. 191) who mentions a specimen from Great South Bay.



FIG. 5. CANVAS-BACK.

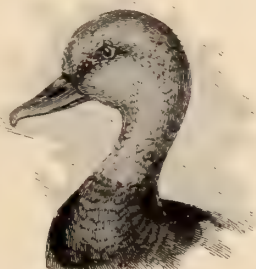


FIG. 6. REDHEAD.

**American Golden-eye**; **Whistler** (*Clangula clangula americana*). In favorable localities within our limits the Whistler is a not common migrant and winter resident.

**Bufflehead**; **Butterball** (*Charitonetta albeola*). A not uncommon migrant and winter resident.

**Old-squaw**; **Old-wife**; **South-southerly** (*Harelda hyemalis*). A common winter resident.

**Harlequin Duck** (*Histrionicus histrionicus*). Breeds from Newfoundland northward, and winters southward to New Jersey. A very rare winter visitant off our coast (Dutcher, Auk, III, 1886, p. 434; VI, 1889, p. 134).

The Labrador Duck (*Camptolaimus labradorius*), which formerly inhabited the Atlantic Coast, breeding from Labrador northward and wintering southward to New Jersey, is doubtless now extinct. The Labrador Duck was apparently once a not uncommon winter bird on Long Island. In a paper by William Dutcher (Auk, VIII, 1891, p. 201; see also Auk, XI, 1894, pp. 41, 175, 176.) summarizing our knowledge of its life-history and enumerating the extant specimens, Mr. George N. Lawrence is quoted as saying: "I recollect that about

forty or more years ago it was not unusual to see them in Fulton Market, and without doubt they were killed on Long Island: at one time I remember six fine males, which hung in the market until spoiled for want of a purchaser." Only forty-two of these Ducks have been recorded as existing in collections. Of this number seven are in the American Museum. (See group, second floor).

**American Eider** (*Somateria dresseri*). A rare winter visitant.

**King Eider** (*Somateria spectabilis*). Breeds from Labrador to the Arctic Regions, migrating southward regularly as far as eastern Long Island (Dutcher, Auk, V, 1888, p. 175).

**American Scoter; Black Coot** (*Oidemia americana*). A more or less common migrant and winter resident.

**White-winged Scoter; White-winged Coot** (*Oidemia deglandi*). A common migrant and winter visitant off our coasts.

**Surf Scoter** (*Oidemia perspicillata*). Found here with the preceding species.

**Ruddy Duck** (*Erismatura jamaicensis*). A not uncommon migrant, occurring in varying numbers.

**Greater Snow Goose** (*Chen hyperborea nivalis*). An irregular transient visitant.



FIG. 7. CANADA GOOSE.

**American White-fronted Goose** (*Anser. albifrons. gambeli*). North America, breeding far northward; in winter, south to Mexico and Cuba. Rare on the Atlantic Coast. It has been recorded on Long Island from Babylon (Giraud), Great South Bay Islip and Montauk (Dutcher, Auk, X, 1893, p. 271).

**\*Canada Goose** (*Branta canadensis*). A common migrant, appearing in November and remaining until our bays are frozen. In the spring the last birds pass on their northward journey as late as early May.

**Hutchins's Goose** (*Branta Canadensis hutchinsi*). A rare migrant in this vicinity.

**White-bellied Brant** (*Branta bernicla glaucogaster*). A common bird, appearing from the north in October and remaining until our bays are frozen, when it retreats farther southward. In April it returns, and the migration is not concluded until May.

**Black Brant** (*Branta nigricans*). This is a western species which is occasionally found on our coasts. It has been recorded from Egg Harbor, N. J. (Lawrence), Babylon and Islip, L. I. (Dutcher, Auk, 1893, pp. 266, 271).

**Barnacle Goose** (*Branta leucopsis*). An Old World species, occurring accidentally on our coasts. A specimen was killed on Jamaica Bay, L. I., in October, 1876 (Lawrence, Bull. Nutt. Orn. Club, II, 1877, p. 18).

**Whistling Swan** (*Olor Columbianus*). Breeds in the far north, and winters as far south as the Gulf of Mexico. It is an exceedingly rare bird on the Atlantic coast north of the Chesapeake. A recent record is that of a bird killed at Flatlands, L. I., within the limits of Greater New York, on Dec. 24, 1901. (Braislin, Auk, XX, 1903, p. 52).

## ORDER HERODINES. HERONS, STORKS, IBISES, ETC.

### FAMILY IBIDIDÆ. IBISES.

**White Ibis** (*Gura alba*). A bird of the Southern States, which has been recorded twice from this vicinity (Raynor South and Moriches, L. I., Giraud).

**Glossy Ibis** (*Plegadis autumnalis*). An Old World species of "irregular distribution in America." It has been recorded once from Southampton L. I., and once from Canarsie Bay, L. I. (Dutcher, Auk, X, 1893, p. 271).

### FAMILY ARDEIDÆ. HERONS, EGRETS, BITTERNS, ETC.

**\*American Bittern** (*Botaurus lentiginosus*). "Temperate North America, south to Guatemala and the West Indies"; breeds but rarely south of Virginia. In this vicinity it is not common during the summer.

**Least Bittern** (*Ardetta exilis*). A locally common summer resident.

**Great Blue Heron** (*Ardea herodias*). With us it is a common migrant, and is probably found as a summer resident in a few localities. It is generally known by the name of "Crane."



**American Egret** (*Herodias egretta*). A southern species, breeding as far north as Virginia, and after the breeding season wandering northward in small numbers. It is here a rare and irregular summer visitant, occurring between August 1 and the last of September (Dutcher, Auk, X, 1884, p. 32). Comparatively recent records of the occurrence of this species are those of Braislin (Auk, XVII, 1900, p. 69; XIX, 1902, p. 145) and Owen (Auk, XV, 1898, p. 51).

**Snowy Heron** (*Egretta candidissima*). One of three individuals seen near Sayville, L. I., May 30, 1885, by William Dutcher and L. S. Foster was "carrying a long stick in its bill" (Dutcher, Auk, III, 1886, p. 435), and possibly was preparing to breed. Now an exceedingly rare bird breeding in a few isolated localities in Florida. Birds identified in life as this species are more apt to be the young of the Little Blue Heron (Braislin, Auk, XIX, 1902, p. 145).

**Little Blue Heron** (*Florida carulea*). This southern species, like the preceding, wanders northward in small numbers after the breeding season, and a few are sometimes found near New York. (See group, second floor).

**\*Green Heron** (*Butorides virescens*). One of our commonest Herons and known under a great variety of names. It haunts the banks of streams and ponds and places its nest of sticks in a bush or the lower branch of a tree.

**\*Black-crowned Night Heron; Quawk** (*Nycticorax nycticorax nævus*). A locally common summer resident. There is a colony containing about 500 pairs not far from New York City. The popular name "Quawk," is derived from the call of the bird.

**Yellow-crowned Night Heron** (*Nyctanassa violacea*). Breeds from South Carolina southward and occasionally strays up the coast as far as Massachusetts. There is but one definite record for this region, that of a specimen taken in April, near Freeport, Queens County, L. I. (Dutcher, Auk, X, 1893, p. 286).

## ORDER PALUDICOLÆ. CRANES, RAILS, ETC.

### FAMILY RALLIDÆ. RAILS, GALLINULES AND COOTS.

**King Rail** (*Rallus elegans*). Breeds as far north as Connecticut and has been known to stray to Maine. It is a rare summer resident of our fresh-water marshes (Dutcher, Auk, V, 1888, p. 176).

**Clapper Rail; Meadow Hen; Marsh Hen** (*Rallus crepitans*). This is an exceedingly common summer resident of the salt marshes of our coasts. Occasionally it winters in our region. (See group, second floor).

**Virginia Rail** (*Rallus virginianus*). A locally common summer resident, a few remaining during the winter.

**Sora; Carolina Rail; Rail-bird** (*Porzana carolina*). A rare summer resident in this vicinity, but in the fall it becomes common, feeding on wild rice of our marshes where, however, it is yearly becoming less numerous.



**Yellow Rail** (*Colurnicops noveboracensis*). Little is known about the nesting habits of this bird. It haunts grassy marshes and seeks safety by hiding or running, and for this reason is rarely seen. Several have been taken during the fall migration in this vicinity, and it is doubtless more common than is generally supposed. (See group, third floor.)

**Black Rail** (*Creciscus jamaicensis*). This bird, though much rarer, has as far as known the same habits as the preceding species and like it is very difficult to observe. It has been taken in the spring at Jamaica Bay and doubtless breeds in this vicinity, since its nest has been found at Saybrook, Conn. (Clarke, Auk, I, 1884, p. 394). (See group, third floor.)

**Corn Crake** (*Crex crex*). This is an Old World species which sometimes strays to Greenland and our Atlantic coast. In this region there are records for Sag Harbor, L. I. (Dutcher, Auk, III, 1886, p. 435), Oakdale, L. I. (Dutcher, Auk, V, 1888, p. 177), and Saybrook, Conn. (Clark, Orn. and Oöl., XIII, 1888, p. 45).

**Purple Gallinule** (*Ionornis martinica*). Tropical America, breeding as far north as South Carolina, and straying casually to Maine. There are but two definite records for this region, Middle Island, L. I. (Helme, Orn. and Oöl., VII, 1882, p. 118) and Indian Pond, near Flatlands, L. I. (Dutcher, Auk, X, 1893, p. 272).

**Florida Gallinule** (*Gallinula galeata*). Temperate and tropical America, breeding as far north as Maine, and wintering from Florida southward. It breeds only locally in the northeastern part of its range, frequenting the borders of ponds or streams surrounded by marshy grounds. Its nest has not been found in the immediate vicinity of New York City, where it is known only as a rare migrant.

**\*Coot; Mud-hen; Crow-duck** (*Fulica americana*). The Mud-hen is a not uncommon bird during migration, but it is recorded as breeding only near Morristown, N. J. (Thurber, True Democratic Banner, newspaper, Nov. 10, 1887).

## ORDER LIMOCOLÆ. SHORE BIRDS.

### FAMILY PHALAROPODIDÆ. PHALAROPES.

**Red Phalarope** (*Crymophilus fulicarius*). The Phalaropes are pelagic birds, not often coming to our coasts unless driven shoreward by storms. There are both August and May records for this species on Long Island.

**Northern Phalarope** (*Phalaropus lobatus*). This bird occurs with us as a regular migrant, and after severe storms it is sometimes common in flocks. (Dutcher, Auk, 1884, p. 33).

**Wilson's Phalarope** (*Steganopus tricolor*). Interior of North America, breeding from northern Illinois northward. With us it is a very rare and irregular migrant.

## FAMILY RECURVIROSTRIDÆ. AVOCETS AND STILTS.

**American Avocet** (*Recurvirostra americana*). A bird of the interior, breeding from Texas to the Saskatchewan. Giraud mentions it as casual on Long Island, and says that a few bred at Egg Harbor, N. J. (Dutcher records four individuals seen by Col. Nicholas Pike on Long Island as follows: Ponquogue, 1844; Canarsie Bay, 1847; Southampton, two, no date (Auk, X, 1893, p. 272).

**Black-necked Stilt** (*Himantopus mexicanus*). A southern species, breeding in the Gulf States and locally in the Mississippi Valley and westward; rare on the North Atlantic coast. Giraud mentions it as "unfrequent," and Dutcher records two specimens taken by Colonel Pike on Great South Bay, one of them in 1843 (Auk, X, 1893, p. 272).

## FAMILY SCOLOPACIDÆ. SNIPES, SANDPIPERS, ETC.

**European Woodcock** (*Scolopax rusticola*). The only record for the occurrence of this species in this vicinity is based on a specimen found in Washington Market, December 6, 1859, which was said to have been killed near Shrewsbury, N. J. (Lawrence, Ann. Lyc. Nat. Hist., VIII, 1866, p. 223).

\***Woodcock** (*Philohela minor*). The woodcock is a not uncommon summer resident and more numerous fall migrant. Owing to the clearing of timber areas, draining of lands and demands of sportsmen, it is however, yearly decreasing in numbers in the vicinity of New York. It arrives early in March, and does not leave us until the ground is frozen. (See group, second floor).

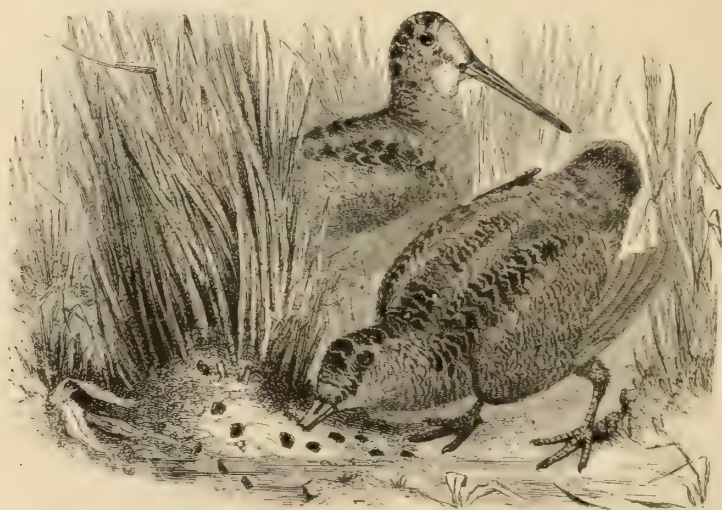


FIG. 8. WOODCOCK.

**Wilson's Snipe; English Snipe** (*Gallinago delicata*). A not uncommon migrant, and crippled birds are said to have nested on several occasions near Chatham, N. J. (Herrick, Forest and Stream, XII, 1879, p. 165). During mild seasons a few pass the winter here (Dutcher, MS).

**Dowitcher** (*Macrorhamphus griseus*). A common migrant, arriving from the south about May 1 and returning from the north between July 10 and August 15.

Migrating Snipe, Sandpipers and Plovers fly, as a rule, some distance off the land and if the weather is calm and clear, very few birds are found on our shores. If, however, during their migrations storms from the right quarter, or fogs occur, many birds are driven shoreward and there results what among sportsmen is known as a "flight."

**Long-billed Dowitcher** (*Macrorhamphus scolopaceus*). This western representative of our common Dowitcher is a rare but regular late fall migrant along the Atlantic coast.

**Stilt Sandpiper** (*Micropalama himantopus*). A not common but by no means rare migrant, occurring chiefly during the fall migration from the middle of July to the middle of September.

**Knot; Robin Snipe** (*Tringa canutus*). A common migrant, passing northward during May and returning from the middle of July to the first of October.

**Purple Sandpiper** (*Arquatella maritima*). A rare but regular winter resident.

**Pectoral Sandpiper; Krieker** (*Actodromas maculata*). A common and sometimes abundant fall migrant in this vicinity; less frequently seen in the spring. It returns from the north in early August, and its migration is concluded about the last of October.

**White-rumped Sandpiper** (*Actodromas fuscicollis*). A not uncommon spring and fall migrant.

**Baird's Sandpiper** (*Actodromas bairdi*). Casual on the Atlantic coast. There are several records for this vicinity, as follows: Rockaway, L. I., August, two specimens, and September, two specimens (N. T. Lawrence, Forest and Stream, X, 1878, p. 235), and Far Rockaway, L. I., August, one specimen (N. T. Lawrence, Auk, II, 1885, p. 273).

**Least Sandpiper; Peep; Meadow Oxeye** (*Actodromas minutilla*). This is one of our commonest Sandpipers, and shares the names "Peep" or "Oxeye" with the Semipalmated Sandpiper. It is seen in small flocks running along our shores and beaches. It passes northward during May and returns about July 10, the fall migration being concluded about September 1.

**Red-backed Sandpiper; Lead-back** (*Pelidna alpina sakhalina*). A very common migrant on our coasts, less common in the spring than in the fall. It migrates northward in early May and returns about September 1, remaining until November.

**Curlew Sandpiper** (*Erolia ferruginea*). "Old World in general, occasional in eastern North America." There are several records of its occurrence on Long Island.

**Semipalmated Sandpiper; Peep; Sand Oxe** (*Ereunetes pusillus*). This is our most common Sandpiper, and during its fall migration it is abundant along our shores in small flocks. It migrates northward during May, returns about July 10, and the fall migration is not concluded until about October 1.

**Western Sandpiper** (*Ereunetes mauri*). This is the western representative of the preceding species. It is not infrequently found on our coast, generally associated with *E. pusillus*. Braislin (Auk, XVI, 1899, p. 191) records it as abundant on Long Island in the fall of 1897.

**Sanderling; Surf Snipe** (*Calidris alba*). An abundant migrant along our coasts, where, as a rule, it is found on the outer beaches. It passes northward during May and returns on its southward journey about July 10, from which date until October it is more or less numerous.

**Marbled Godwit; Brown Marlin** (*Limosa fedoa*). This is a rare bird on the Atlantic coast, where it occurs only as an irregular fall visitant.

**Hudsonian Godwit; Ring-tailed Marlin** (*Limosa hamastica*). In this vicinity the Ring-tailed Marlin is an irregular fall migrant (Dutcher, Auk, III, 1889, p. 437). Kobbe (Auk, XXI, 1904, p. 79) records a flight of this species as occurring at Quogue, L. I., August 31, 1903.

**\*Greater Yellow-legs** (*Totanus melanoleucus*). A common migrant, arriving in the spring about the latter half of April and returning in the latter half of July, the migration not being concluded until November.

**Yellow-legs; Summer Yellow-legs** (*Totanus flavipes*). Very rare in the spring, but abundant during its southward migration, which begins about July 15 and ends in September.

**\*Solitary Sandpiper** (*Helodromas solitarius*). A not uncommon migrant passing northward in May and returning in July. It is not a true Shore-bird, but is more frequently found near fresh-water ponds and streams.

**Willet** (*Catoptrophorus semipalmatus*). In this vicinity it occurs only as a rare fall migrant. It is probable that the Western Willet (*C. s. inornata*) is also occasionally found on our coasts.

**Ruff** (*Pavoncella pugnax*). "Northern parts of the Old World, straying occasionally to eastern North America." There are three specimens of this bird in the American Museum from North America, two of which, in the Lawrence Collection, are labeled "Long Island," while the third is in the Elliot Collection and is labeled "Barnegat, N. J." (For record of the occurrence of this species in America, see Deane, Auk, XXII, 1905, p. 411; and Palmer, Auk, XXIII, 1906, p. 99.)

**Bartramian Sandpiper; Upland Plover; Field Plover** (*Bartramia longicauda*). A rather rare migrant and still rarer summer resident. It arrives about the middle of April and frequents fields and pastures.

**Buff-breasted Sandpiper** (*Tryngites subruficollis*). A bird of the interior, breeding in the far north and wintering in South America. It is very rare on the Atlantic coast. Giraud records "a party of five" as seen in August and September (N. T. Lawrence, Forest and Stream, X, 1879, p. 235); one was taken in August at Montauk Point (Berier, Bull. N. O. C., VI, 1880, p. 126); Dutcher mentions an August specimen from Suffolk County and a midsummer bird from Shinnecock Bay (Auk, VI, 1889, p. 136); and Braislin records a male taken August 30, 1903 at Rockaway Beach (Auk, XXII, 1905, p. 169).

**\*Spotted Sandpiper; Tip-up** (*Actitis macularia*). This is the common Sandpiper so frequently seen on our ponds, streams and beaches, and is one of the few members of this family which breeds here. It arrives about April 25 and remains until October.

**Long-billed Curlew; Sickle-bill** (*Numenius longirostris*). A rare and irregular fall visitant.

**Hudsonian Curlew; Jack Curlew** (*Numenius hudsonicus*). The Jack Curlew, as it is locally known, is a not uncommon migrant in this vicinity. It passes northward in May, and the southern migration occurs between the middle of July and the first of October.

**Eskimo Curlew; Dough-bird; Fute** (*Numenius borealis*). This species has decreased in numbers during recent years and is believed by some ornithologists to be on the verge of extinction. There is but one record of its recent occurrence, that of a male shot by R. L. Peavey at Rockaway Beach, L. I., September 14, 1902 (Braislin, Auk, XXI, 1904, p. 289).

#### FAMILY CHARADRIIDÆ. PLOVERS.

**Lapwing** (*Vanellus vanellus*). An Old World species, of accidental occurrence in America. The only record for eastern North America south of Greenland is that of a specimen shot at Merrick, L. I., December, 1883, (Dutcher, Auk, III, 1886, p. 438).

**Black-bellied Plover; Beetle-head** (*Squatarola squatarola*). A common migrant, more numerous in the fall. It passes northward from about April 15 to June 1, and the return migration occurs between August 1 and November 1.

**Golden Plover; Green-back** (*Charadrius dominicus*). A rare spring and common fall migrant, occurring chiefly in September.

**Kildeer** (*Oxyechus vociferus*). In the neighborhood of New York City the Kildeer is a rare summer resident and not uncommon migrant. It arrives in March and remains with us until November.

**Semipalmated Plover; Ring-neck** (*Ægialitis semipalmata*). The Ring-neck is one of our most common shore-birds. It passes northward in May and returns about July 15, the fall migration not being concluded until October 1.



**Piping Plover** (*Ægialitis meloda*). It is here a rare local summer resident and more common migrant, arriving in April and remaining until September.

**Wilson's Plover** (*Ochthodromus wilsonius*). Breeds as far north as Virginia, and strays casually to Nova Scotia. There are several records for Long Island (Dutcher, Bull. N. O. C., IV, 1879, p. 242; Auk, III, 1885, p. 438, Shinnecock Bay), and one for Bridgeport, Conn. (Averill, List of Birds found in the vicinity of Bridgeport, 1892, p. 9).

#### FAMILY APHRIZIDÆ. SURF BIRDS AND TURNSTONES.

**Turnstone; Brant-bird; Calico-back** (*Arenaria morinella*). With us it is a common migrant passing northward in May, returning about August 1 and remaining until September.

#### FAMILY HÆMATOPODIDÆ. OYSTER-CATCHERS.

**Oyster-catcher** (*Hæmatopus pallitus*). Breeds as far north as Virginia and occasionally strays to Nova Scotia. It is here of rare and irregular occurrence (Dutcher, Auk, X, 1893, p. 272).

### ORDER GALLINÆ. GALLINACEOUS BIRDS.

#### FAMILY TETRAONIDÆ. GROUSE, PARTRIDGES, ETC.

**\*Bob-white; Quail** (*Colinus virginianus*). Quail are not uncommon in the vicinity of New York, but they are so eagerly hunted, that, as the country becomes more thickly settled, only the most rigid enforcement of the game-laws will preserve them from extermination. Recent severe winters have greatly decreased the numbers of this species, virtually exterminating it in some localities, and were it not for the liberation of southern birds by sportsmen, it is probable that the species would be exceedingly rare if not indeed extinct throughout most of the region surrounding New York City. (See group, second floor).

**\*Ruffed Grouse; Partridge** (*Bonasa umbellus*). Partridges are much less common with us than Quails. They are birds of the woods, and for this reason disappear with the forests, while Quails, on the contrary become more numerous as the country is cleared. (See group, second floor).

In the early part of the nineteenth century Pinnated Grouse or Heath Hens (*Tympanuchus cupido*) were abundant in some parts of Long Island, but they have been extinct for about sixty years (Giraud, Birds of Long Island, p. 195, and Dutcher, Auk, X, 1893, p. 272). As late as 1860 odd this species occurred in numbers on the Plains of the Jersey Pine Barrens west of Barnegat, where it was exterminated by indiscriminate shooting at all seasons (Chapman, Bird-Lore, V, 1903, p. 50).

The Wild Turkey (*Melcagris gallopavo silvestris*) is still found in small numbers in the wilder, more mountainous portions of Pennsylvania, but has

long been extinct in this vicinity. De Kay (Zoölogy of New York, II, Birds, 1844, p. 200) writes that he had not met with the species in New York State, but was informed at the time he wrote it was found in the counties of Sullivan, Rockland, Orange, Alleghany and Cattaraugus. This species is not mentioned by either Giraud or Lawrence.

## ORDER COLUMBÆ. PIGEONS.

### FAMILY COLUMBIDÆ. DOVES AND PIGEONS.

**Passenger Pigeon; Wild Pigeon** (*Ectopistes migratorius*). Fifty years ago the Wild Pigeon was an abundant bird in the vicinity of New York, but here, as elsewhere throughout its range, it has become very rare. In place of the thousands that used to visit us it is now observed irregularly and rarely. (Lawrence, Auk, VI, 1889, p. 196, and Dutcher, Auk, X, 1893, p. 274). There appears to be but one definite record since 1894 of the occurrence of the Wild Pigeon near New York, that of an immature male shot at Englewood, N. J., June 23, 1896, by C. I. Wood (Chapman, Auk, XIII, 1896, p. 341).

\***Mourning Dove** (*Zenaidura macroura*). A common summer resident, under favorable circumstances passing the winter.

**Ground Dove** (*Columbigallina passerina terrestris*). This is a species of the South Atlantic and Gulf States. It has been once taken in this vicinity (Grinnell, Bull. N. O. C., III, 1878, p. 147), but its occurrence is purely accidental, and it is possible that the specimen captured was an escaped cage-bird.

## ORDER RAPTORES. BIRDS OF PREY.

### FAMILY CATHARTIDÆ. AMERICAN VULTURES.

**Turkey Vulture; Turkey Buzzard** (*Cathartes aura septentrionalis*). Of more or less regular occurrence in New Jersey as far north as Plainfield in the interior and Sandy Hook on the coast. It is also occasionally seen on Long Island. One record notes the occurrence of a flock of eight birds of this species in Orange County, N. Y. (Reynolds, Forest and Stream, XVIII, 1894, p. 181).

**Black Vulture** (*Catharista urubu*). Breeds from North Carolina southward, and occasionally strays as far north as Maine. There are records for Sandy Hook, N. J. (Robt. B. Lawrence, Bull. N. O. C., V, 1880, p. 116), and Coney Island, L. I. (Berier, Bull. N. O. C., VI, 1881, p. 126).

### FAMILY FALCONIDÆ. FALCONS, HAWKS, EAGLES, ETC.

**Swallow-tailed Kite** (*Elanoides forficatus*). In this vicinity it has been recorded from Raynor South, L. I. (Giraud, Birds of Long Island, p. 13), "South shore of Long Island" (Berier, Bull. N. O. C., VI, 1881, p. 126), Chatham, N. J. (Herrick, Forest and Stream, XII, 1879, p. 165), and Piermont, N. Y. (Nicholas, Auk, XVII, 1900, p. 386).

\***Marsh Hawk** (*Circus hudsonius*). A permanent resident, common except during the winter.

\***Sharp-shinned Hawk** (*Accipiter velox*). It is here an uncommon summer and rare winter resident.

\***Cooper's Hawk** (*Accipiter cooperi*). With us a not uncommon summer and rare winter resident. This bird, the Sharp-shinned Hawk and the rare Duck Hawk and Goshawk, are the only species of our Hawks which habitually live on birds. The others feed largely on insects and small field-mice, and being thus actually beneficial, should be protected by law.

**Goshawk** (*Astur atricapillus*). A rare winter visitant.

\***Red-tailed Hawk** (*Buteo borealis*). The Red-tail is one of our commonest Hawks and is resident throughout the year.

\***Red-shouldered Hawk** (*Buteo lineatus*). A permanent resident. It is probably our most common Hawk and with the Red-tail is the one to which the name "Chicken," or "Hen Hawk," is generally, but incorrectly, applied.

**Swainson's Hawk** (*Buteo swainsoni*). A western species of rare occurrence on the Atlantic coast. There is apparently but one record of its capture near New York City, that of a specimen shot near Cornwall, N. Y., October 14, 1892 (Dutcher, Auk, X, p. 83).

\***Broad-winged Hawk** (*Buteo platypterus*). A rather uncommon summer resident.

**Rough-legged Hawk** (*Archibuteo lagopus sancti-johannis*). A rare winter resident.

**Golden Eagle** (*Aquila chrysaetos*). North America, of rare occurrence east of the Mississippi. It has been recorded from Islip, L. I. (Giraud), Canarsie, L. I. (Dutcher), Gravesend, L. I. (Johnson), Long Branch, N. J. (Chapman, Auk, XV, 1898, p. 54), and Highland Falls, N. Y. where Mearns states, it is occasionally observed and was formerly known to nest.

\***Bald Eagle** (*Haliaetus leucocephalus*). This Eagle is here a rather rare bird; it is said by Mearns to nest in the Highlands of the Hudson. On Long Island it is a not uncommon resident and breeds in several localities (Dutcher MS).

**Gyr Falcon** (*Falco rusticolus gyrfalco*). An arctic species, rarely visiting the United States. The only record for this vicinity is that of a specimen killed on Long Island in the winter of 1856 (Lawrence, Ann. Lyc. Nat. Hist., New York, VIII, 1866, p. 280; see also Brewster, Auk, XII, 1895, p. 180).

**Black Gyr Falcon** (*Falco rusticolus obsoletus*). "Labrador, south in the winter to Maine and New York." There is but one record of its occurrence in this vicinity, viz., a specimen shot in the fall of 1875, near Flushing, L. I. (Berier, Bull. N. O. C., VI, 1881, pp. 126, 247).

**Duck Hawk** (*Falco peregrinus anatum*). This Falcon, the "noble Peregrine" of Falconry, is a not uncommon migrant, especially along our coast, and is a rare summer resident along the Palisades and Highlands of the Hudson, where it is known to breed. (See group, second floor).



DUCK HAWK  
Group, Hall No. 234





**Pigeon Hawk** (*Falco columbarius*). A common migrant, occurring chiefly on our coasts.

**\*American Sparrow Hawk\*** (*Falco sparverius*). With us it is a not common resident but abundant migrant along the coasts.

**American Osprey; Fish Hawk** (*Pandion haliaetus carolinensis*). A locally abundant summer resident arriving early in April and remaining until October. At certain localities along our coasts, the Fish Hawk is found nesting in colonies.



FIG. 9. AMERICAN OSPREY.

#### FAMILY STRIGIDÆ. BARN OWLS.

**American Barn Owl** (*Strix pratincola*). Occasionally found as far north as Massachusetts, and breeds from Long Island southward through Mexico. The Barn Owl is here a rare permanent resident. There are numerous records of its nesting, and it appears to have increased in numbers during recent years.

#### FAMILY BUBONIDÆ. HORNED OWLS, ETC.

**\*American Long-eared Owl** (*Asio wilsonianus*). A rather uncommon resident.

**Short-eared Owl** (*Asio accipitrinus*). Common during the migrations, and while a few probably breed, there is no definite record of their doing so.

\***Barred Owl** (*Syrnium varium*). Next to the Screech Owl this is our commonest Owl. Its loud, sonorous hooting, *whoo, whoo, whoo, too-who, too-who-ah*, is heard in the spring and again in late summer and is familiar to many who are not acquainted with its author.



FIG. 10. SHORT-EARED OWL.

**Great Gray Owl** (*Scotiaptex nebulosa*). In winter to the northern border of the United States. An individual shot near Mendham, N. J., is the only one which has been recorded from near New York City (Thurber, True Democratic Banner, newspaper, Morristown, N. J., Nov. 10, 1887).

\***Saw-whet Owl** (*Cryotglaux acadica*). A regular and, in some localities, a not uncommon winter resident.

**Screech Owl** (*Megascops asio*). The Screech Owl is the commonest and best known of our Owls. It is present throughout the year. (See group, second floor).



SCREECH OWL  
Group, Hall No. 208



**Great Horned Owl** (*Bubo virginianus*). A rather rare resident. This is the only one of our Owls which habitually preys upon poultry, the others feed largely on field-mice and shrews.

\***Snowy Owl** (*Nyctea nyctea*). An irregular winter visitant, sometimes occurring in considerable numbers.

**Hawk Owl** (*Surnia ulula caparoch*). There is apparently but one record of its capture in this vicinity, that of a specimen shot near Bay Ridge, L. I. (Dutcher Auk, X, 1893, p. 275).

# ORDER COCCYGES. CUCKOOS, ETC.

## FAMILY CUCULIDÆ. CUCKOOS, ANIS, ETC.

\***Yellow-billed Cuckoo** (*Coccyzus americanus*). A common summer resident, arriving about May 10 and departing the last of September. (See group, third floor).

\***Black-billed Cuckoo** (*Coccyzus erythrophthalmus*). A common summer resident arriving and departing at about the same time as the preceding species.

## FAMILY ALCEDINIDÆ. KINGFISHERS

\***Belted Kingfisher** (*Ceryle alcyon*). A common summer resident, arriving the latter part of March and remaining until the streams and ponds, from which it obtains its food, are frozen.

# ORDER PICI. WOODPECKERS.

## FAMILY ALCEDINIDÆ. KINGFISHERS.

\***Hairy Woodpecker** (*Dryobates villosus*). A rather uncommon resident.

\***Downy Woodpecker** (*Dryobates pubescens medianus*) next to the Flicker, the Downy is our commonest Woodpecker.

**Red-cockaded Woodpecker** (*Dryobates borealis*). Southern United States, westward to Indian Territory, and northward to Tennessee and Virginia. This bird is accidental near New York, the only record of its occurrence being based on a specimen taken at Hoboken, N. J. (Lawrence, Ann. Lyc. Nat. Hist., VIII, 1866, p. 291).

\***Yellow-bellied Woodpecker** (*Sphyrapicus varius*). A common spring and fall migrant.

**Pileated Woodpecker** (*Ceophlax pileatus abieticola*). "Formerly whole wooded region of North America; now rare or extirpated in the more thickly settled parts of the Eastern States." This large Woodpecker occurs near New York only as a very rare straggler; there are no recent records.





FIG. 11. RED-HEADED  
WOODPECKER.

\***Red-headed Woodpecker** (*Melanerpes erythrocephalus*). A summer resident of local distribution and a not uncommon and sometimes abundant migrant. Occasionally it is found in winter.

**Red-bellied Woodpecker** (*Centurus carolinus*). Eastern United States breeding from Florida to Virginia, and in the interior, to Ontario and Southern Dakota; occasionally strays to Massachusetts; winters from southern Ohio southward. Giraud speaks of this bird as breeding on Long Island, but it now occurs here only rarely and irregularly.

\***Flicker: High-hole; Clape** (*Colaptes auratus luteus*). Our commonest Woodpecker. It is resident, but is much more common in the summer than in the winter, and is particularly numerous during its migrations in September and October.

#### ORDER MACROCHRIES. GOATSUCKERS, SWIFTS, ETC.

##### FAMILY CAPRIMULGIDÆ. GOATSUCKERS.



FIG. 12. NIGHTHAWK.

\***Whip-poor-will** (*Antrostomus vociferus*). In some localities near New York City the Whip-poor-will is a common summer resident. It arrives about May 1 and leaves about October 1.

\***Nighthawk** (*Chordeiles virginianus*). The Nighthawk is here a more or less common local summer resident. Even in New York City, where it has been known to lay eggs on the house-top, its characteristic note, *peent, peent*, uttered while it is coursing for food, is not infrequently heard. It arrives early in May and migrates southward in September and October, sometimes occurring at this season in large flocks.

##### FAMILY MICROPODIDÆ. SWIFTS.

\***Chimney Swift** (*Chatura pelagica*). An abundant summer resident, arriving the latter part of April and remaining until October. (See group, second floor).

## FAMILY TROCHILIDÆ. HUMMINGBIRDS.

\***Ruby-throated Hummingbird** (*Trochilus colubris*). This, the only species of Hummingbird found in eastern North America, is here a common summer resident, arriving early in May and remaining until October.

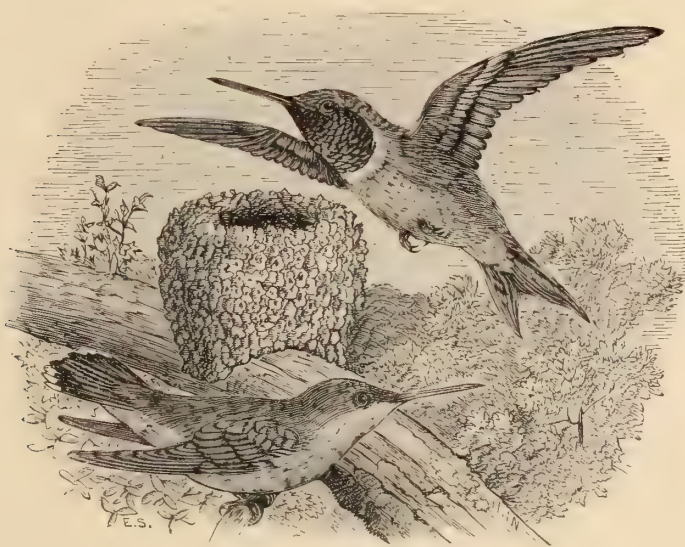


FIG. 13. RUBY-THROATED HUMMINGBIRDS AND NEST.

## ORDER PASSERES. PERCHING BIRDS.

## FAMILY TYRANNIDÆ. TYRANT FLYCATCHERS.

\***Kingbird** (*Tyrannus tyrannus*). A common summer resident, arriving early in May and remaining until October. (See group, third floor).

**Arkansas Kingbird** (*Tyrannus verticalis*). A western species; the only records for this vicinity are those of a young male taken at Riverdale, N. Y., October 19, 1875, (Bicknell, Bull. N. O. C., IV, 1879, p. 60), and a specimen taken at Princeton, N. J., Sept. 29, 1894 (Phillips, Proc. D. V. O. C., II, p. 14).

\***Great-crested Flycatcher** (*Myiarchus crinitus*). A common summer resident, arriving early in May and remaining until September.

\***Phoebe** (*Sayornis phæbe*). A common summer resident arriving about March 20 and leaving early in November.

\***Olive-sided Flycatcher** (*Nuttallornis borealis*). A migrant passing north in May, when it is apparently rare, and returning between the latter part of August and late September, when it is not uncommon.

\***Wood Pewee** (*Horizopus virens*). A common summer resident of our woods, arriving about May 15 and remaining until the latter part of September.

\***Yellow-bellied Flycatcher** (*Empidonax flaviventris*). A rather rare spring and not uncommon fall migrant, arriving in May and returning from its northern home early in August.

\***Green-crested Flycatcher** (*Empidonax virescens*). A common summer resident of the Lower Hudson River Valley as far north as Sing Sing. On Long Island it apparently breeds on the north shore, while there are but two records for Connecticut, an adult taken at Suffield, June 24, 1874 (Merriam, Birds, Conn., p. 58) and a nest with young at Greenwich, June 25, 1893 (Voorhees, Auk, XI, 1894, p. 259). A rare summer resident in the vicinity of Plainfield, N. J. (Miller, MS). (See group, third floor).

**Alder Flycatcher** (*Empidonax trailli alnorum*). A rather rare migrant and a local summer resident. A nest and eggs, not fully identified, but with little doubt that of this species, was found by C. L. Brownell at Nyack, N. Y. At Plainfield, N. J., W. DeWitt Miller has found this species a locally common breeding bird (Auk, XVIII, 1901, p. 108; XX, 1903, p. 68).

\***Least Flycatcher** (*Empidonax minimus*). A common summer resident; it arrives about May 1 and remains until late in September.

#### FAMILY ALAUDIDÆ. LARKS.

**Skylark** (*Alauda arvensis*). Individuals of this species have from time to time been liberated near New York City. In 1887 a small colony became established near Flatbush, L. I., where a nest containing young was found (Dutcher, Auk, V, 1888, p. 180). Without apparent increase these birds evidently manage to hold their own (Braislin, Auk, XVI, 1899, p. 191; Bildersee, Bird-Lore, VI, 1904, p. 204).



FIG. 14. HORNED LARK.

**Horned Lark; Shore Lark** (*Otocoris alpestris*). A common winter resident along the coasts; less common or very rare in the Hudson Valley.

**Prairie Horned Lark** (*Otocoris alpestris praticola*). This small race of the Horned Lark is of rather rare occurrence in this vicinity. It is apparently extending its range eastward and there is one record of its having prob-

ably bred on Long Island (Dutcher, Auk, V, 1888, p. 180), where it also occurs during the winter.

## FAMILY CORVIDÆ. CROWS, JAYS, MAGPIES, ETC.

\***Blue Jay** (*Cyanocitta cristata*). A common resident, more numerous during the fall migration than at other times of the year.

The Canada Jay (*Perisoreus canadensis*), a northern species, is included by Lawrence in his "Catalogue of Birds" on the basis of an individual killed in July near Manhattanville, New York City. This specimen is now in the American Museum (No. 42,253). Its plumage is much worn and its toe-nails are abnormally long, facts which, taken in connection with the place and date of the bird's capture, induce me to believe that it had escaped from confinement.



FIG. 15. BLUE JAY.

**American Raven** (*Corvus corax principalis*). Now of very rare occurrence in this vicinity. It is said to have been formerly common on the northern New Jersey coast (Lawrence), and is still uncommon along the southern coast of the State (Stone, Auk, XI, 1834, p. 137).

\***American Crow** (*Corvus brachyrhynchos*). The Crow is here an abundant resident, but, as in the case of other species which are present the year round, it is probable that the individuals which summer with us pass the winter farther south, while our winter birds come to us from the north.

\***Fish Crow** (*Corvus ossifragus*). A common inhabitant of the Lower Hudson River Valley as far north as Sing Sing and occasionally reaches Highland Falls. In Connecticut it is of regular occurrence as far east as Stratford (Eames, Auk, VI, 1889, p. 338), while on Long Island its exact status appears to be unknown, though it is probably not uncommon. A few remain on the coast during the winter.



## FAMILY STURNIDÆ. STARLINGS.



FIG. 16. STARLING, (SUMMER PLUMAGE).

\*Starling (*Sturnus vulgaris*). This Old World species has been introduced into this country on several occasions, but only the last importation appears to have been successful. The birds included in this lot were imported and released in Central Park, under the direction of Eugene Schieffelin of this city. They seem to have left the Park and to have established themselves in various places in the upper part of the city. A pair have bred for

three successive seasons in the roof of this Museum. S. H. Chubb reports a pair nesting in a church at 122nd st. and Lenox avenue, and they also have nested at 100th st. and Riverside Drive. C. B. Isham tells me he has found their nest at Kingsbridge, New York City, and that he repeatedly observed a flock of fifty birds in the same locality during the late summer and fall of 1893 and 1894.

To the above statement, which stands as it appeared in the first (1894) edition of this List, may be added the further information, obtained from Mr. Schieffelin, that 80 Starlings were released on March 6, 1890, and 40 more on April 25, 1891. So far as I am aware the present (1906) boundary of the range of this species in America is marked by New Haven, Conn., on the east, Ossining, N. Y., on the north and Red Bank and Princeton, on the south. It is resident throughout the year, but gathers in flocks, sometimes containing several hundred birds, in the fall, when it wanders, about the country. Its economic status remains to be determined, but from the bird-



FIG. 17. STARLING, (WINTER PLUMAGE).



lover's point of view the Starling is a decided acquisition to the bird-life of our cities where its long-drawn, cheery whistle is in welcome contrast to the noisy chatter of House Sparrows.

FAMILY ICTERIDÆ. BLACKBIRDS, ORIOLES, ETC.

**\*Bobolink; Reedbird** (*Dolichonyx oryzivorus*). A locally distributed summer resident, arriving in early May and remaining until October. In August the males assume the Reedbird plumage and resort to our wild-rice marshes, where they are joined by large numbers from the north, which pause to feed on the wild-rice.

Twenty-five years ago the Bobolink was an abundant and generally distributed summer resident in this vicinity. Since that date it has rapidly decreased in numbers and is now entirely wanting in localities where it was formerly of regular occurrence.



FIG. 18. BOBOLINK.

**\*Cowbird** (*Molothrus ater*). A common summer resident arriving late in March and remaining until November. It has been recorded as occurring in winter (Foster, Abst. Proc. Linn. Soc., No. 5, 1893, p. 2).

**\*Red-winged Blackbird** (*Agelaius phoeniceus*). A common summer resident, abundant during the migrations when it occurs in large flocks. It is one of the first birds to reach us in the spring, frequently arriving before March 1, and it remains until December.

**\*Meadowlark** (*Sturnella magna*). A common summer resident, occurring in reduced numbers during the winter, when it is largely confined to the extensive marshes near the coast.

**\*Orchard Oriole** (*Icterus spurius*). A common summer resident, arriving early in May and remaining until September. (See group, third floor).

\***Baltimore Oriole** (*Icterus galbula*). A somewhat more common summer resident than the preceding species. It arrives early in May and remains until September. (See group, third floor).

\***Rusty Blackbird** (*Euphagus carolinus*). A common migrant, passing northward in March, returning in September and sometimes remaining during the winter.

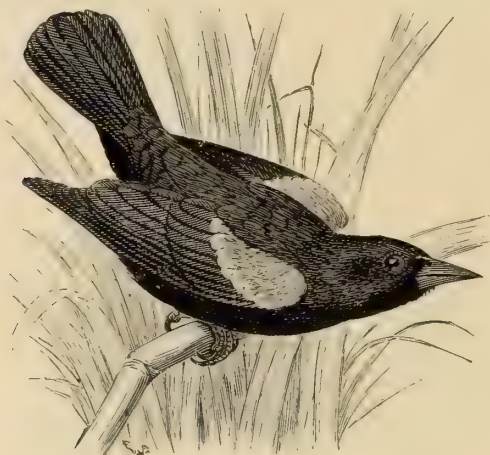


FIG. 19. RED-WINGED BLACKBIRD.

\***Purple Grackle: Crow Blackbird** (*Quiscalus quiscula*). A common summer resident of local distribution, nesting in colonies. It is one of our earliest migrants, arriving from the south with the Red-winged Blackbird about March 1. During the breeding season it is not seen far from the vicinity of its nest, but about July 1, when the young are on the wing, the birds gather in small flocks and wander over the country, pausing wherever they find an abundance of food. These flocks gradually coalesce and, in October and November, form enormous gatherings numbering thousands of birds.

\***Bronzed Grackle** (*Quiscalus quiscula æneus*). A spring and fall migrant, sometimes not uncommon.

#### FAMILY FRINGILLIDÆ. FINCHES, SPARROWS, ETC.

**Evening Grosbeak** (*Hesperiphona vespertina*). During the winter and early spring of 1890 there was a phenomenal incursion of Evening Grosbeaks into the northern United States. The most southern record of their occurrence in the Atlantic States was at Summit, N. J., where, on March 6, Mr. W. O. Raymond observed a flock of eight birds (Orn. and Oöl., XV, 1890, p. 46). No specimens were collected, but Mr. Raymond watched the birds for some time at a distance of about eight feet, and he has since examined skins of the species in this Museum, thus confirming his identification.

\***Pine Grosbeak** (*Pinicola enucleator leucura*). This species occurs here in the winter and then only at irregular intervals. It last appeared in numbers during the winter of 1903-4 when it was first observed at Englewood, N. J., Oct. 25 (Chapman, Bird-Lore, V, 1903, p. 199).

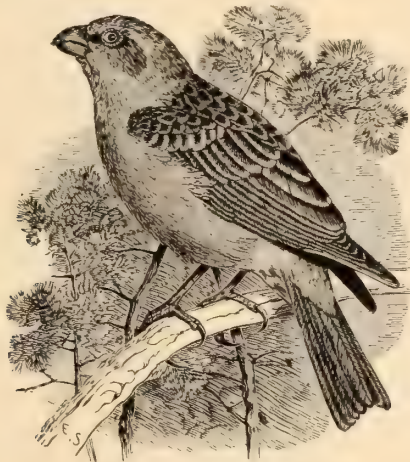


FIG. 20. PINE GROSBK.

\***House Sparrow; English Sparrow** (*Passer domesticus*). From the report of the Division of Economic Ornithology of the Department of Agriculture (Washington, 1889), we learn that English Sparrows were first introduced into New York City in 1860, when twelve birds were released in Madison Square. In 1864 they were introduced in Central Park, and in 1866 two hundred were set free in Union Park. From these, and one or two other small additional importations of a few pairs each, have descended the countless numbers of Sparrows which to-day inhabit our streets and parks. In this latitude the English Sparrow has been known to rear six broods in a season, and their marvelous rate of increase is graphically given in a table in the report already mentioned, which shows that in ten years the progeny of a single pair might amount to 275,716,983,698.

With the discordant notes of these ubiquitous little pests constantly in our ears we may read with mixed humor and regret the following quotation from Lawrence's Catalogue of New York Birds (Ann. Lyc. Nat. Hist., VIII, 1866, p. 287): "I first observed them in the spring of 1865. A friend, conversant with our local native birds, informed me that he had seen a species in the shrubbery around the church on the corner of 5th avenue and 29th street, with which he was not familiar; on going to ascertain what they were, to my surprise I found them to be House Sparrows; they were domiciled in the ivy which grew on the walls of the church, and were quite gentle and fearless, some alighting in the street and dusting themselves quite near to where I stood."

\***The European Chaffinch** (*Fringilla caelebs*), several pairs of which were released in Central Park under the direction of Eugene Schieffelin in 1890, is occasionally observed in Central Park where three individuals appear to exist at present. Whether, however, they are the descendants of the introduced birds or escaped cage-birds is unknown.

\***The Greenfinch** (*Chloris chloris*) a European species was observed in Central Park, May 17, 1903, by C. G. Abbott.

\***Purple Finch** (*Carpodacus purpureus*). In the vicinity of New York City the Purple Finch is a rather rare summer resident, a very common migrant and irregular winter resident. It is apparently increasing in numbers during the summer on Long Island (Dutcher, MS).

\***American Crossbill** (*Loxia curvirostra minor*). A regular winter visitant. This erratic species has on several occasions been found breeding south of its regular breeding range. Such an instance occurred at Riverdale, N. Y., where it was found nesting on April 22, 1874 (Bicknell, Bull. N. O. C., IV, 1880, p. 7).

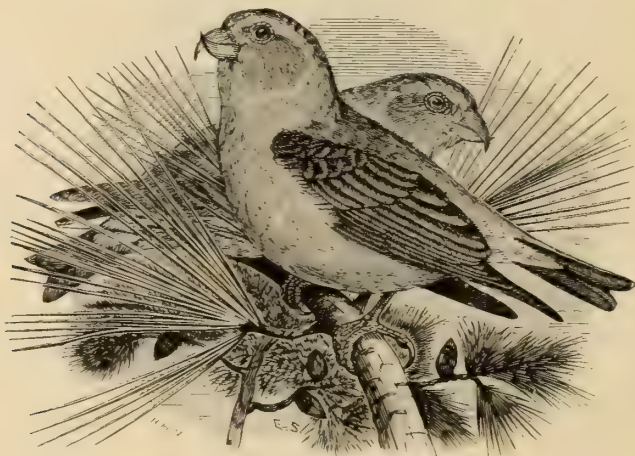


FIG. 21. AMERICAN CROSSBILL.

\***White-winged Crossbill** (*Loxia leucoptera*). Of more rare and irregular occurrence in winter than the preceding species. This and the preceding species last occurred in numbers during the winter of 1899-1900 (Chapman Bird-Lore, II, 1900, pp. 25, 59).

**Redpoll** (*Acanthis linaria*). This species is here an irregular winter visitant, sometimes occurring in considerable numbers.

**Greater Redpoll** (*Acanthis linaria rostrata*). Two specimens taken at Sing Sing, N. Y., are the only individuals of this species which have been recorded from this vicinity (Fisher, Bull. N. O. C., VIII, 1883, p. 121).



The **European Linnet** (*Acanthis cannabina*) is recorded from Scarborough, N. Y. (G. H. Thayer, Auk, XVII, 1900, p. 389); but the large number of cage-birds of this species annually imported into this country makes it probable that the bird secured was an assisted immigrant.



FIG. 22. REDPOLL.

\***American Goldfinch** (*Astragalinus tristis*). The Goldfinch, Yellowbird, or Thistlebird, is a common resident here.



FIG. 23. AMERICAN GOLDFINCH.

\***European Goldfinch** (*Carduelis carduelis*). A European species which was introduced into this country at Hoboken, N. J., in 1878. The following year it appeared in Central Park and has since spread over the upper parts of the city where in favorable localities it is not uncommon. It is with us throughout the year. (Adney, Auk, III, 1886, p. 409).



**\*Pine Siskin; Pine Finch** (*Spinus pinus*). A more or less common fall and winter visitant. On two occasions it has been found nesting in the Lower Hudson Valley, at Sing Sing, May 25, 1883 (Fisher, Bull. N. O. C., VIII, 1883), and at Cornwall-on-Hudson, May 12, 1887 (Allen, Auk, IV, 1887, p. 284). (See group, third floor).

**\*Snowflake; Snow Bunting** (*Passerina nivalis*). On Long Island this bird is an abundant winter resident on the sand-flats near the ocean (Dutcher, MS). In the Lower Hudson Valley it is much less common.

**Lapland Longspur** (*Calcarius lapponicus*). A rare winter resident; sometimes found with flocks of the preceding, but more frequently associated with Horned Larks.

**Chestnut-collared Longspur** (*Calcarius ornatus*). "Interior of North America, from the Saskatchewan Plains south to Texas." A specimen of this western species was taken at Long Island City, February 16, 1889 (Hendrickson, Auk, VI, 1889, p. 190).

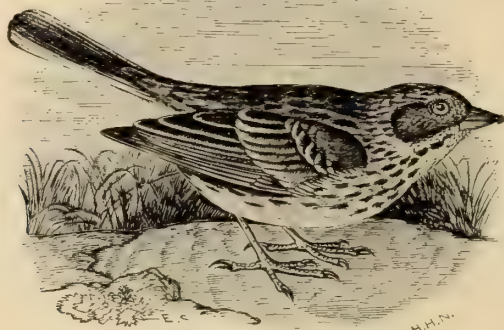


FIG. 24. VESPER SPARROW.

**\*Vesper Sparrow; Grass Finch; Bay-winged Bunting** (*Poæcetes gramineus*). A common summer resident, arriving about April 1, and remaining until the latter part of November.

**Ipswich Sparrow** (*Passerculus princeps*). A common winter resident, confined strictly to the immediate vicinity of the coasts, where it is found from the middle of October to the first of April (Dutcher, Auk, III, 1886, p. 441).

**\*Savanna Sparrow** (*Passerculus sandwichensis savanna*). This species is here a rare summer resident and abundant migrant, arriving about April 1 and departing in November and December. It breeds at Morristown, N. J. (Thurber) and is said to remain throughout the winter in the salt-marshes at Bridgeport, Conn. (Averill). Braislin, (Auk, XVI, 1899, p. 192) records it from Garden City, L. I., July 17, 1897, and Flatbush, L. I., Jan. 30, 1895.

**Grasshopper Sparrow ; Yellow-winged Sparrow** (*Coturniculus savannarum passerinus*). Locally a common summer resident, arriving about May 1 and remaining until October.

**Henslow Sparrow** (*Ammodramus henslowi*). In this vicinity the Henslow sparrow has been found in but few localities where, however, it is apparently not uncommon. It is recorded as breeding at Morristown, N. J. (Thurber), and Boonton, Morris County, N. J. (Judd, Auk, XIV, 1897, p. 326). Summer resident in small numbers near Plainfield, N. J. (Miller, MS).

**Sharp-tailed Sparrow** (*Ammodramus caudacutus*). An abundant summer resident; with the exception of a colony on the Hudson at Piermont, confined entirely to the salt marshes of our coasts. (See group, third floor).

**Nelson Sharp-tailed Sparrow** (*Ammodramus nelsoni*). This species is known here only as a rather rare fall migrant in the Hudson River Valley, occurring from the latter part of September to the latter part of October.

**Acadian Sharp-tailed Sparrow** (*Ammodramus nelsoni subvirgatus*). Occurs with the preceding. (On the distribution of the Sharp-tailed Sparrows see Dwight, Auk, XIII, 1896, p. 275).



FIG. 25. SEASIDE SPARROW.

**Seaside Sparrow** (*Ammodramus maritimus*). This is an even more abundant summer resident than the Sharp-tailed Sparrow and, like it, is confined exclusively to our coasts, with the exception of a colony in the Piermont marshes. (See group, third floor).

**Lark Sparrow** (*Chondestes grammacus*). Interior of North America, eastward to Illinois, breeding from Texas to Manitoba; accidental on the Atlantic coast. There are two records for this vicinity, Sayville, L. I., August 20, 1879 (Earle, Bull. N. O. C., VI, 1881, p. 58) and Schraalenburg, N. J., November 26, 1885 (Chapman, Auk, III, 1886, p. 136).

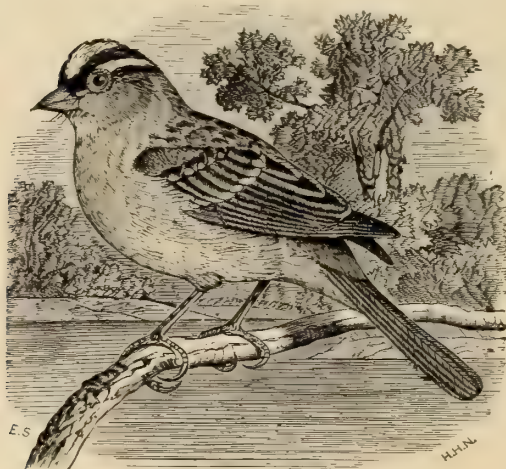


FIG. 26. WHITE-CROWNED SPARROW.

\***White-crowned Sparrow** (*Zonotrichia leucophrys*). A rather rare migrant passing northward in May and returning in October. Braislin (*Auk*, XV, 1898, p. 59) records a specimen taken at Parkville, L. I., April 10, 1897.

\***White-throated Sparrow** (*Zonotrichia albicollis*). An abundant migrant and locally common winter resident. It arrives from the north the latter part of September and remains with us until the middle of May.

\***Tree Sparrow** (*Spizella monticola*). An abundant winter resident, arriving from the north about November 1 and remaining until April.

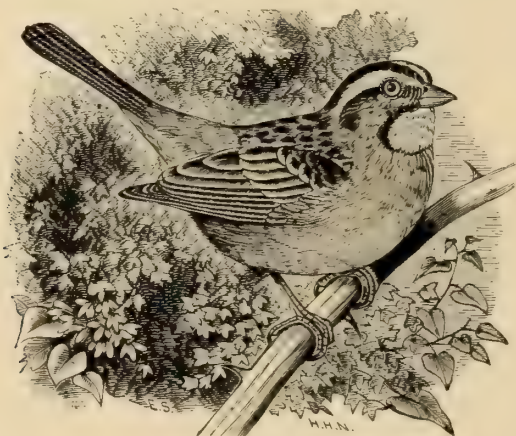


FIG. 27. WHITE-THROATED SPARROW.

\***Chipping Sparrow; Chippy** (*Spizella socialis*). An abundant summer resident, arriving from the south about April 1 and remaining until November.

\***Field Sparrow** (*Spizella pusilla*). An abundant summer resident, appearing in the spring about April 1 and not departing southward until November or even December. Of rare but regular occurrence in winter at Plainfield, N. J. (Miller, MS). (See group, third floor).

\***Junco; Snowbird** (*Junco hyemalis*). The Junco is one of our most abundant winter birds. It comes to us from the north late in September and remains until May.



FIG. 28. JUNCO.

\***Song Sparrow** (*Melospiza cinerea melodia*). An abundant summer and common winter resident. (See group, third floor).

**Lincoln Sparrow** (*Melospiza lincolni*). In this vicinity the Lincoln Sparrow is a rare but regular migrant, passing northward in May and southward in September and October.

\***Swamp Sparrow** (*Melospiza georgiana*). An abundant summer resident, especially in the great marshes of the Hackensack, and a rare winter resident. (See group, third floor).

\***Fox Sparrow** (*Passerella iliaca*). A common spring and fall migrant, passing northward in March and April and southward in October and November. There are several winter records for Princeton, N. J. (Scott, Bull, N. O. C., IV, 1879, p. 82).



\***Towhee; Chewink** (*Pipilo erythrophthalmus*). An abundant summer resident, arriving about April 20, remaining until late October, and rarely into the winter. (See group, second floor).

\***Cardinal** (*Cardinalis cardinalis*). The vicinity of New York City is about the northern limit of the Cardinal's range on the Atlantic coast. It is here a not uncommon resident of local distribution. In the Hudson Valley it is rarely found north of Hastings and Nyack; it is very rare eastward along the sound, and also on Long Island, but is common in Central Park, New York City, where I have seen nine individuals at one time. (See group, second floor).

\***Rose-breasted Grosbeak** (*Zamelodia ludoviciana*). A common summer resident in the Hudson River Valley, arriving about May 1 and remaining until October. On Long Island it is a rare summer resident (Dutcher, MS). (See group, second floor).

\***Blue Grosbeak** (*Guiraca carulea*). There are several records of this southern bird's occurrence in this vicinity. It has been taken at Canarsie, L. I., May, 1843 (Dutcher, Auk, V, 1893, p. 276); Morristown, N. J. (Thurber, True Democratic Banner, newspaper, Nov. 17, 1889); Snake Hill, N. J. (Bicknell, Bull. N. O. C., III, 1878, p. 132), and Manhattan Island (DeKay, Birds, N. Y., p. 146).

\***Indigo Bunting** (*Cyanospiza cyanea*). A common summer resident in this vicinity, arriving about May 1 and remaining until October 1.

**Painted Bunting** (*Cyanospiza ciris*). Breeds from the Gulf States northward to Kansas, southern Illinois and North Carolina. The capture of several specimens of this bird in this vicinity has been recorded (Bicknell, Bull. N. O. C., III, 1878, p. 132). It is possible that they were escaped cage-birds.

**Dickcissel; Black-throated Bunting** (*Spiza americana*). Eastern United States, mostly in the Mississippi Valley, breeding from Texas to Minnesota, and wintering in Central and South America. Breeds east of the Alleghanies now only rarely and locally. About forty years ago this bird was evidently a regular and not uncommon summer resident in this vicinity. (See Giraud, Chapman *apud* Galbraith, Auk, VIII, 1891, p. 395), but it occurs now only rarely and irregularly. Recent records are: Miller's Place, L. I., September 29 and October 10 (Dutcher, Auk, VI, 1889, p. 13) and Blithewood, L. I., August 25 (Johnson, Auk, VIII, 1891, p. 116). In July, 1904, W. De Witt Miller found a pair of this species breeding at Plainfield, N. J. (Auk, XXI, 1904, p. 487). J. Dwight, Jr., records the occurrence of a male Dickcissel at Kingston, N. Y., June 5, 1897 (Auk, XIV, 1897, p. 95).

#### FAMILY TANAGRIDÆ. TANAGERS.

**Western Tanager** (*Piranga ludoviciana*). Western North American north to British Columbia. The only record of the occurrence of this western species in this vicinity is that of a young male taken at Fort Montgomery, N. Y., December 21, 1881 (Mearns, Auk, VII, 1890, p. 55).



\***Scarlet Tanager** (*Piranga erythromelas*). A common summer resident, arriving early in May and remaining until about October 1. (See group, third floor).

**Summer Tanager** (*Piranga rubra*). Eastern United States, breeding from Florida to southern New Jersey, wandering casually to Nova Scotia, and wintering in Central and South America. This species is of rare and irregular occurrence in this vicinity. (Hendrickson, Auk, I, 1885, p. 290; Dutcher, Auk, III, 1886, p. 412; XIX, 1902, p. 291; V, 1888, p. 181; Mearns, Auk, VII, 1890, p. 55; Braislin, Auk, XIX, 1902, p. 147).

#### FAMILY HIRUNDINIDÆ. SWALLOWS.

\***Purple Martin** (*Progne subis*). This bird breeds in colonies and is of local distribution during the breeding season. It was formerly not uncommon in the vicinity of New York City, but the English Sparrows have taken possession of its nesting-houses, and at present it is found in but few places.

\***Cliff Swallow**; **Eave Swallow** (*Petrochelidon lunifrons*). Like most of the Swallows it nests in colonies, and in this region generally places its mud nests beneath the projecting eaves of a barn. It appears to be less common during the summer than it was twenty or more years ago, but is a common migrant particularly in the fall. According to Mearns, it arrives as early as April 16. (See group, second floor).

\***Barn Swallow** (*Hirundo erythrogaster*). A common summer resident and abundant fall migrant. It arrives about April 20 and remains until October 1.

\***Tree Swallow** (*Iridoprocne bicolor*). Arrives from the south early in April. There are a few recorded instances of its breeding near New York City, but, generally speaking, it passes northward to more distant nesting grounds. July 1 the birds begin to return from the north, making their home in the marshes of the Hackensack, where, by July 20, they may be found in countless numbers. In the morning they leave their roosts in the "cat-tails" and fly out over the adjoining country to feed. At night they return. Their numbers increase until about September 1, then decrease, and by October 20 only a few stragglers remain.

\***Bank Swallow** (*Riparia riparia*). A locally common summer resident, breeding in colonies where the conditions are favorable. It arrives about May 1 and remains until October. (See group, second floor).

**Rough-winged Swallow** (*Stelgidopteryx serripennis*). This Swallow is locally common in the Lower Hudson River Valley, at Riverdate (Bicknell), Hastings-on-the-Hudson (Rowley), Sing Sing (Fisher); at Highland Falls, which seems to be near the northern limit of its range in the Hudson Valley, it is a rare summer resident (Mearns). I have seen it near Ramapo, N. Y., and with J. Dwight, Jr., found a small colony breeding at Port Jervis, N. Y. It breeds near New Haven, Connecticut, in small numbers, and is rare as far north as Hartford (Sage). On Long Island it is of rare and irregular occurrence (Dutcher).

## FAMILY AMPELIDÆ. WAXWINGS, ETC.

**Bohemian Waxwing** (*Ampelis garrulus*). This species occurs here only as an exceedingly rare and irregular winter visitant. There are no recent records.

\***Cedar Waxwing**; **Cedarbird** (*Ampelis cedrorum*). A common summer resident; occurring irregularly in the winter.

## FAMILY LANIIDÆ. SHRIKES.

\***Northern Shrike**; **Butcherbird** (*Lanius borealis*). A more or less regular but rather uncommon winter resident.

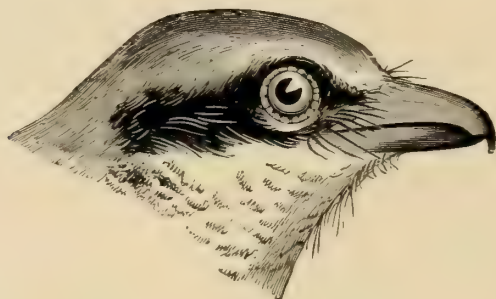


FIG. 29. NORTHERN SHRIKE.

**Migrant Shrike** (*Lanius ludovicianus migrans*). The Migrant Shrike is found here is a rare but regular migrant during April, the latter part of August and in September, and, rarely, until December. It has been known to breed but once, at Sing Sing, N. Y., where a fledgeling was taken June 16, 1877 (Fisher, Bull. N. O. C., IV, 1879, p. 61).

## FAMILY VIREONIDÆ. VIREOS.

\***Red-eyed Vireo** (*Vireosylva olivacea*). This is one of our abundant summer residents. It arrives from the south about May 8 and remains until October. (See group, third floor).

**Philadelphia Vireo** (*Vireosylva philadelphia*). A very rare migrant.

\***Warbling Vireo** (*Vireosylva gilva*). A common summer resident of local distribution, arriving early in May. (See group, third floor).

\***Yellow-throated Vireo** (*Lanivireo flavifrons*). A common summer resident, arriving about May 7 and remaining until the latter part of September.

\***Blue-headed Vireo** (*Lanivireo solitarius*). A not uncommon migrant, passing northward during the latter part of April and first part of May, and returning late in September.

\***White-eyed Vireo** (*Vireo noveboracensis*). A common summer resident about New York City. It reaches us from the south about May 7, and remains until early October. (See group, third floor).

## FAMILY MNIOTILTIDÆ. WOOD-WARBLED.

\***Black and White Warbler** (*Mniotilta varia*). A rather common summer resident and common migrant. It appears the latter part of April and is with us until the first part of October. (See group, third floor).

**Prothonotary Warbler** (*Protonotaria citrea*). Eastern North America, breeding from the Gulf States to southern Illinois and Virginia, and wintering in the tropics. Its occurrence near New York City is accidental; there are but two records, viz., a male shot at Jamaica, L. I. (Dutcher, Auk, X, 1893, p. 276), and a male seen by E. P. Bicknell near the northern limit of New York City, June 2, 1895 (Auk, XII, 1895, 306). Dutcher has recorded a specimen which struck the Montauk Point Lighthouse, August 27, 1886 (Auk, V, 1888, p. 182).

\***Worm-eating Warbler** (*Helminthos vermivorus*). This bird is one of our rarer summer residents, though it is not uncommon some years in the early fall migration. In the Hudson River Valley it is regularly found as far north as Highland Falls (Mearns) and occurs at Fishkill (Stearns). In Connecticut it breeds at Saybrook and New Haven, but is not common, and at Portland it has been taken only twice (Sage). On Long Island it is considered exceedingly rare (Dutcher).

\***Blue-winged Warbler** (*Helminthophila pinus*). This species arrives early in May and remains until September 1. It is a common summer resident of the Lower Hudson Valley, at least as far north as Highland Falls (Mearns). In Connecticut it is common at Saybrook and New Haven, but is rare as far north as Portland, where but one or two pairs breed each season (Sage). On Long Island it is known to breed only along the north shore, where it is probably not uncommon in favorable localities. Mrs. E. G. Britton records the occurrence of an individual of this species in Bronx Park in January, 1900 (Bird-Lore, II, 1900, p. 26; see also Noble, Bird-Lore, II, 1900, p. 59). (See group, third floor).

Brewster's Warbler (*Helminthophila leucobronchialis*) with us is a rare but regular summer resident in northern New Jersey, the Lower Hudson Valley and southern Connecticut, but has been taken only once on Long Island (Howell). Specimens have been recorded from Morristown (Thurber), Maplewood (Riker), and Englewood, N. J., where it has been found nesting (Chapman, Auk, IV, 1887, p. 348; IX, 1892, p. 302). Farther north in the Hudson Valley it has been found at Nyack (Bicknell), and at Sing Sing five specimens have been secured (Fisher, Bull. N. O. C., IV, 1879, p. 234; VI, 1881, p. 245; Auk, II, 1885, p. 378). In the Lower Connecticut Valley this bird seems to be more frequent than in any other part of its range. It has been found at Saybrook, Seymour, New Haven, Portland and other localities, the principal records being as follows: Eames, Auk, V, 1888, p. 427; VI, 1889, p. 305; Bishop, Auk, VI, 1889, p. 192; Sage, Auk, X, 1893, p. 208. Probably not more than one-third of all the specimens recorded are typical *leucobronchialis*, the remaining two-thirds presenting every stage of intergradation between this bird and typical *H. pinus*.

Lawrence's Warbler (*Helminthophila lawrencei*) is a much rarer bird than the preceding. There are records for only six specimens from the immediate vicinity of New York City, viz. Chatham, N. J. (Herrick), Hoboken, N. J. (Lawrence), Rye, N. Y. (Vorhees, Auk, V, 1888, p. 427), Greenwich, Conn. (Vorhees, Auk, XI, 1894, p. 259), Cold Spring Harbor, L. I. (Braislin, Auk, XX, 1903, p. 53), and New York Zoological Park, where a male was found breeding with a female *pinus* (Bildersee, Bird Lore, VI, 1904, p. 131; Beebe, Auk, XXI, 1904, p. 387).

The status of both Brewster's and Lawrence's Warblers is still unsettled. They are generally considered to be hybrids between *H. pinus* and *H. chrysoptera*, and it has also been suggested that dichromatism may play a part in producing their coloration. Their relationship will be found discussed under the following references: Brewster, Bull. N. O. C., VI, 1881, p. 218; Ridgway, Auk, II, 1885, p. 359; Manual N. A. Birds, 1887, p. 486; Birds of North and Middle America, II, 1902, pp. 452, 453; Thayer, Auk, XIX, 1902, p. 401; Bishop, Auk, XXII, 1905, p. 21).

**\*Golden-winged Warbler** (*Helminthophila chrysoptera*). In the immediate vicinity of New York City, this bird occurs as a rather rare spring migrant, but in the early southward migration, in August, it is sometimes not uncommon. It has been found nesting at Nyack, N. Y. (Brownell) and probably breeds regularly from that point northward.

**\*Nashville Warbler** (*Helminthophila rubricapilla*). This species is here a rather common migrant and a rare summer resident as far south as Highland Falls. It arrives about May 10 and returns on its southward journey during late August, the last migrants being seen about September 25. A breeding female was taken by Chapman at Englewood, N. J., June 16, 1887, (Auk, VI, 1889, p. 304).

**\*Orange-crowned Warbler** (*Helminthophila cclata*). This Warbler occurs here as an exceedingly rare migrant. There are records of only six specimens, all but one of which occurred in the fall. (Howell, Auk, X, 1893, p. 91).

**\*Tennessee Warbler** (*Helminthophila peregrina*). With us this bird is a rather rare spring migrant but is sometimes not uncommon in the fall. It passes northward early in May and returns on its southward journey in September.

**\*Northern Parula Warbler** (*Compsothlypis americana usneæ*). The Parula Warbler is here a more or less abundant migrant and local summer resident. It arrives from the south about May 7 and the last individuals are observed in early October.

**\*Cape May Warbler** (*Dendroica tigrina*). This is one of our rarest spring migrants, passing northward about May 15. In the fall migration immature birds are sometimes not uncommon.

**\*Yellow Warbler** (*Dendroica æstiva*). A common summer resident. It arrives from the south about May 5 and remains until September. (See group, third floor).



\***Black-throated Blue Warbler** (*Dendroica cerulescens*). A common migrant, passing northward early in May and returning in September.



FIG. 30. MYRTLE WARBLER.

\***Myrtle Warbler**; **Yellow-rumped Warbler**; (*Dendroica coronata*). An abundant migrant in our vicinity and in favorable localities where bayberries are abundant, it passes the whole winter. Migrants begin to arrive in early April, and the southward migration takes place during the latter part of September and October.

\***Magnolia Warbler** (*Dendroica maculosa*). In this vicinity it is a common migrant, passing northward early in May and returning late in August and in September.

**Cerulean Warbler** (*Dendroica cerulea*). Breeds in the Mississippi Valley as far north as Minnesota, and eastward as far as Cayuga Co., N. Y., and winters in the tropics. Its occurrence here is accidental, and there are but three records of its capture, one of a male taken in Kings County, L. I., (Dutcher, Auk, X, 1893, p. 277), of a male taken at Highland Falls, May 17, 1875 (Mearns, Birds Hudson Highlands, p. 154), and one of a specimen taken at Boonton, Morris Co., N. J., in September, 1887 (Judd, Auk, XIV, 1897, p. 326).

\***Chestnut-sided Warbler** (*Dendroica pensylvanica*). With us it is a common migrant, and, in recent years, has become a locally common summer resident. It arrives early in May, and the return migration occurs between August 10 and October 1.

\***Bay-breasted Warbler** (*Dendroica castanea*). As a rule the Bay-breasted is one of our rarest transient Warblers but during some seasons it is found in numbers. It passes northward about the middle of May and returns in September.

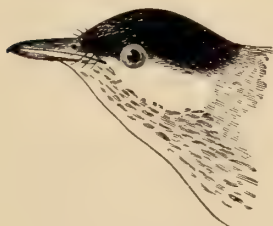


FIG. 31. BLACKPOLL WARBLER.

\***Blackpoll Warbler** (*Dendroica striata*.) The Blackpoll is one of our most abundant migrants and is the last of the transient Warblers to pass northward in the spring. It arrives from the south about May 7 and returns on its southern journey in September.

\***Blackburnian Warbler** (*Dendroica. blackburniae*). A rather uncommon spring migrant, passing northward during the first of May, but is not uncommon some year during its return migration in September.

**Yellow-throated Warbler** (*Dendroica domina*). Southern United States, breeding as far north as Virginia and wintering from Florida southward. There is but one record of the occurrence of this southern species near New



York City. It is based on the capture of a male in Kings County, L. I. (Dutcher, Auk, X, 1893, p. 277).

**\*Black-throated Green Warbler** (*Dendroica virens*). In the immediate vicinity of New York City this bird is found chiefly as a migrant, arriving from the south late in April and returning about the middle of August. It is known to breed at Highland Falls, N. Y. (Mearns), Bridgeport, Conn. (Averill), Millers Place, L. I. (Dutcher, MS), and at Demarest, N. J., where on June 5, 1904. B. S. Bowdish found a nest built in a skunk cabbage about fourteen inches from the ground (Auk, XXIII, 1906, p. 17).

**\*Pine Warbler** (*Dendroica vigorsi*). This Warbler is of local distribution in this vicinity. In northern New Jersey, the Lower Hudson Valley and southern Connecticut it occurs only as a rare migrant, but on certain parts of Long Island, where the scrub pines afford it congenial surroundings, it is not uncommon and breeds.

**Palm Warbler** (*Dendroica palmarum*). This species is of rather rare but regular occurrence here. One specimen was taken at Sing Sing, N. Y., April 29, 1882 (Fisher, Bull. N. O. C., VII, 1882, p. 249), two at Riverdale, N. Y., in the spring of 1877 (Bicknell, Bull. N. O. C., V, 1880, p. 182), and one struck the Fire Island Lighthouse, September 23, 1887 (Dutcher, Auk, V, 1888, p. 182). Braislin (Auk, XIX, 1902, p. 149) records it as "common" near Brooklyn between September 25 and October 7, 1895, and Miller (Bird-Lore, V, 1903, p. 109) states that it was rather common near Plainfield, N. J., between September 22 and October 4, 1903.

**\*Yellow Palm Warbler; Yellow Redpoll** (*Dendroica palmarum hypochrysea*). A common migrant arriving from the south about April 10, and returning late in September and in October.

**\*Prairie Warbler** (*Dendroica discolor*). The distribution of the Prairie Warbler in this vicinity is much like that of the Pine Warbler. It is rare in northern New Jersey and the Lower Hudson Valley, where however, it has been found breeding once (Highland Falls. Mearns), but is not uncommon on some parts of Long Island. At Bridgeport, Conn., it is a common migrant and may breed (Averill). (See group, third floor).

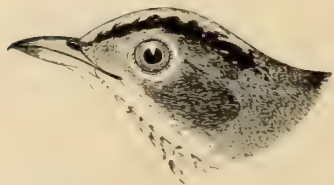


FIG. 32. OVENBIRD.

**\*Ovenbird** (*Sciurus aurocapillus*). The Ovenbird is one of our abundant summer residents, arriving about May 1 and remaining until the middle of October. (See group, third floor).

**Northern Water-thrush** (*Seiurus noveboracensis*). A common migrant, passing northward during May and returning about September 1. Cherrie (Auk, XIX, 1902, p. 210) records the probable breeding of this species at Cold Spring Harbor, L. I.



LOUISIANA WATER THRUSH  
Group, Hall No. 308



**Grinnell's Water-thrush** (*Seiurus noveboracensis notabilis*). Western North America; eastward during the migrations to Virginia and South Atlantic States. This western species has been recorded only from Raritan, N. J., May 30, 1889 (Southwick, Auk, IX, 1892, p. 303), and Princeton, N. J. Sept. 10, 1879 (Babson).

**Louisiana Water-thrush** (*Seiurus motacilla*). It is a common summer resident in the lower Hudson Valley, where it has been found as far north as Lake George (Fisher), and is not uncommon in the lower Connecticut Valley. There are two records for Massachusetts and two for Rhode Island. On Long Island it is very rare (Dutcher). (See group, third floor).

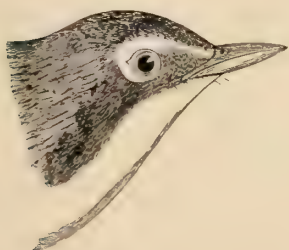


FIG. 33. KENTUCKY WARBLER.

**\*Kentucky Warbler** (*Opornis formosa*).

This is a common summer resident on the banks of the Lower Hudson River and has been recorded from Fort Lee and Riverdale (Bicknell), Englewood (Chapman), and Sing Sing (Fisher), beyond which point it is as yet unknown. In Connecticut there are but three records, viz: at Suffield where a male was taken August 16, 1876 (Merriam), at Greenwich, where a pair and a fledgeling were seen and the male taken July 10, 1892 (Vorhees, Auk, X, 1893, p. 86) and at West Stratford, where a male was shot May, 30, 1888 (Lucas, Orn. and Ool., XIV, 1889, p. 62). On Long Island it is very rare, there being but one recent record of its occurrence (Dutcher). It is wholly absent in the vicinity of Plainfield, N. J., (Miller) and at Princeton (Babson).

**Connecticut Warbler** (*Oporornis agilis*). This species is an exceedingly rare spring migrant east of the Alleghanies, and I know of no record of its occurrence here at that season; in the fall, however, it is not uncommon, and sometimes is abundant, arriving as early as September 3 and remaining until the latter part of the month.

**\*Mourning Warbler** (*Oporornis philadelphia*). This species is one of our rare Warblers; it passes northward during the latter half of May.

**\*Northern Yellowthroat** (*Geothlypis trichas brachidactyla*). One of our most abundant summer residents. It arrives about May 5 and remains until October. (See group, third floor.)

**Yellow-breasted Chat** (*Icteria virens*). A common summer resident, arriving about May 5 and remaining until September.

**\*Hooded Warbler** (*Wilsonia mitrata*). The Hooded Warbler is here near the northern limit of its range. At Englewood, N. J., it is an abundant summer resident, arriving about May 5 and remaining until the middle of September. At Riverdale, N. J., it is locally common (Bicknell), at Sing Sing it is not common (Fisher), but at Highland Falls it is "very common" (Mearns). It has been taken at Fishkill, the most northern point in the

Hudson River Valley from which it has been recorded. In Connecticut it is common at Saybrook and New Haven, but is rare north of these points (Sage). In Massachusetts it has been found only twice. On Long Island it is rare. At Plainfield and Princeton, N. J., it is a rare migrant.

**\*Wilson's Warbler** (*Wilsonia pusilla*). This bird is here a rather uncommon spring migrant, passing northward from the 12th to the 30th of May, but is not uncommon at times during its return journey, which takes place between August 15 and September 15.

**\*Canadian Warbler** (*Wilsonia canadensis*). A common migrant, passing north from May 10 to June 10 and returning between August 5 and September 10.

**\*American Redstart** (*Stoephaga ruticilla*). A common summer resident of our woodland; it arrives about May 5 and remains until early October. (See group, third floor.)

#### FAMILY MOTACILLIDÆ. WAGTAILS.

**\*American Pipit; Titlark** (*Anthus pensilvanicus*). The Titlark is a generally common, and, along our coasts, an abundant migrant. It travels northward from the latter part of March to early May and returns on its southern journey during October and November.

#### FAMILY MIMIDÆ. MOCKINGBIRDS, THRASHERS, ETC.

**\*Mockingbird** (*Mimus polyglottos*). Breeds from the Bahamas and Mexico to southern Illinois and northern New Jersey, rarely to Massachusetts, and winters from North Carolina southward. The Mockingbird is of rare occurrence in this vicinity and doubtless many of the specimens reported are escaped cage-birds. It has, however, been found breeding at several localities, and at Tenafly, N. J., a pair returned to the same locality for several years (Auk, VI, 1889, p. 305). On several occasions Mockingbird have been found here during the winter and have shown their ability to withstand our coldest weather as long as they can obtain an abundance of food.

**\*Catbird** (*Galeoscoptes carolinensis*). An abundant summer resident, arriving about May 3 and remaining until October 20. (See group, third floor.)

**\*Brown Thrasher** (*Toxostoma rufum*). A common summer resident, appearing about April 20 and remaining until the middle of October and occasionally later. (See group, second floor.)

#### FAMILY TROGLODYTIDÆ. WRENS.

**\*Carolina Wren** (*Thryothorus ludovicianus*). Eastern United States, breeding from the Gulf States to southern Iowa, northern Illinois, and southern Connecticut; resident, except at the northern limit of its range. Generally speaking the Carolina Wren is a rather rare bird in this vicinity but on the





FIG. 34. CAROLINA WREN.

eastern slope of the Palisades, as far north as Piermont, N. Y., it is common during the summer (Chapman, Auk, X, 1893, p. 87). It has been found on Long Island in the winter (Dutcher, MS). Since the above was written, in 1894, this species appears to have increased in numbers, locally.

\***House Wren** (*Troglodytes aedon*). This common and familiar species comes to us about May 1 and remains until October.

\***Winter Wren** (*Olbiorchilus hiemalis*). Just before the House Wren leaves us, or about October 1, the Winter Wren comes from the north and is not uncommon until the House Wren returns in May.

**Short-billed Marsh Wren** (*Cistothorus stellaris*). This species is here a common summer resident of very local distribution.



FIG. 35. WINTER WREN.

**Long-billed Marsh Wren** (*Telmatodytes palustris*). This abundant inhabitant of our reedy marshes arrives in May and remains until October or November.

FAMILY CERTHIIDÆ. CREEPERS.

\***Brown Creeper** (*Certhia familiaris americana*). The Creeper is here a rather common winter resident, arriving from the north about October 1 and remaining until April.

FAMILY SITTIDÆ. NUTHATCHES.

\***White-breasted Nuthatch** (*Sitta carolinensis*). A common permanent resident.

\***Red-breasted Nuthatch** (*Sitta canadensis*). This bird is sometimes common from the later part of August to October and occasionally remains during the winter.

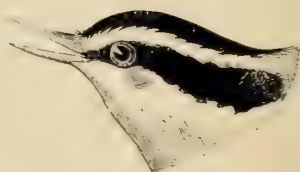


FIG. 36. RED-BREADED NUTHATCH.

FAMILY PARIDÆ. TITMICE.

**Tufted Titmouse** (*Bæolophus bicolor*). This bird is resident and breeds as far north as Orange, N. J. (Riker), and Staten Island, N. Y. (Hollick). Beyond these points it occurs regularly but rarely. It is observed yearly in April at Englewood, N. J. (Chapman). There are few records for Connecticut, and although Giraud leads us to believe it was not uncommon and bred on Long Island when he wrote, it is now very rare there. (Braislin, Auk, XIX, p. 148.)



FIG. 37. CHICKADEE.

\***Chickadee** (*Penthestes atricapillus*). The Chickadee is here a common permanent resident, but is more numerous during its migration in October than at other times.

**Carolina Chickadee** (*Penthestes carolinensis*). "Southeastern United States, north to New Jersey and Illinois." This species reaches the southern limit of our district at Princeton, N. J., where it is a not uncommon resident, while *P. atricapillus* is found there only in the winter (Babson).

#### FAMILY SYLVIIDÆ. KINGLETS AND GNATCATCHERS.

\***Golden-crowned Kinglet** (*Regulus satrapa*). A not common winter resident in favorable localities; it arrives from the north about October 1 and remains until May.



FIG. 38. GOLDEN-CROWNED KINGLET.

\***Ruby-crowned Kinglet** (*Regulus calendula*). A common spring, and an abundant fall migrant, arriving from the south about the middle of April and returning late in September.

\***Blue-gray Gnatcatcher** (*Poliophtila carulea*). Eastern United States, breeding from the Gulf States to northern Illinois, southern Ontario and northern New Jersey, and wandering rarely to Minnesota and Maine, winters from Florida southward. There are numerous records of capture of this southern species in the vicinity of New York City, but it is not known to occur regularly nearer than Princeton, N. J., where it arrives from "April 25 to May 1" (Scott, *The Country*, I. 1878, p. 354).

**Townsend's Solitaire** (*Myadestes townsendi*). A male of this species was taken at King's Park, L. I., November 25, 1905, by J. A. Weber (Dwight, *Auk*, XXIII, 1906, p. 105).

\***Wood Thrush** (*Hylocichla mustelina*). The Wood Thrush is an abundant summer resident, arriving about May 1 and remaining until early October. It

may rightly claim to rank as the most gifted of our summer songsters. (See group, second floor.)

**Wilson's Thrush** (*Hylocichla fuscescens*). Wilson's Thrush, or the Veery, as it is better called, is a common summer resident, arriving about May 1 and remaining until September. (See group, third floor.)

**Gray-checked Thrush** (*Hylocichla aliciae*). A common migrant, passing northward in May and southward in September and October.

**Bicknell's Thrush** (*Hylocichla bicknelli*). So far as records go, this is a rather rare migrant, occurring in May and September and October, but careful search will doubtless show it to be more common than is generally supposed.

**Olive-backed Thrush** (*Hylocichla ustulata swainsoni*). The Olive-backed Thrush is a common migrant in this vicinity. It passes northward in May and southward in September and October.

**Hermit Thrush** (*Hylocichla guttata pallasii*). An abundant migrant and occasionally is found in small numbers during the winter. In the spring it passes northward between April 10 and May 1; its fall migration takes place between October 1 and November 1. There is a record of its probable breeding at Lake Ronkonkoma, L. I. (Dutcher, Auk, III, 1886, p. 443).

**American Robin** (*Merula migratoria*). The Robin is our most abundant summer resident, and in favorable localities a few may be found in the winter. Migrants begin to arrive toward the last of February, and the species is abundant until December. (See group, third floor.)

**Varied Thrush** (*Ixoreus naevius subsp. ?*). The local status of this Pacific coast bird appears to be well stated in Coues' "Birds of the Colorado Valley," where George N. Lawrence is quoted as follows:

"Besides Cabot's New Jersey example, two others have been procured near New York City—one at Islip, Long Island, shot in the fall, in company with Robins, and now in the possession of the person who secured it, the other at Hoboken, New Jersey. Both were received in the flesh by Mr. J. Akhurst, to be mounted; the Hoboken one was subsequently destroyed by fire in the taxidermist's workshop. All the specimen's in my own cabinet came from the Pacific side."

The Cabot specimen mentioned above by Lawrence is possibly the one referred to by Turnbull (Birds of East. Penn. and N. J.), but without data.

**Wheatear** (*Saxicola ananthe leucorhoa*). This northern species is of accidental occurrence in this vicinity; it has been twice recorded from Long Island (Lawrence, Ann. Lyc. Nat. Hist., VIII, 1886, p. 282; Dutcher, Auk, X, 1893, p. 277.)

**Bluebird** (*Sialia sialis*). The Bluebird is here a common summer resident, an abundant migrant, and not infrequent winter resident. Migrants begin to arrive from the south early in March.



THE AMERICAN ROBIN  
Group, Hall No. 308





LIST OF  
PRINCIPAL PAPERS RELATING TO THE BIRDS OF THE VICINITY  
OF NEW YORK CITY.

1844. DE KAY, J. E. Zoology of New York, or the New York Fauna; comprising detailed descriptions of all the animals hitherto observed within the State of New York, with brief notices of those occasionally found near its borders, and accompanied by appropriate illustrations. Part II, Birds. Albany: 1 Vol., 4 to, pp. xii, 380, pll. col'd, 141.  
Treats of 308 species. "Though still constantly quoted—and properly to be referred to—it has ceased to be regarded as an authority" (Coues).
1844. GIRAUD, J. P., JR. The Birds of Long Island... New York: published by Wiley & Putnam, 161 Broadway... 1 Vol., 8vo., pp. i—xxiv, 1—397.  
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“ Prothonotary . . . . .	[71]	“ European . . . . .	[40]
“ Tennessee . . . . .	[72]	Woodpecker, Downy . . . . .	[53]
“ Wilson's . . . . .	[78]	“ Hairy . . . . .	[53]
“ Worm-eating . . . . .	[71]	“ Pileated . . . . .	[53]
“ Yellow . . . . .	[72]	“ Red-bellied . . . . .	[54]
“ Yellow-palm . . . . .	[74]	“ Red-cockaded . . . . .	[53]
“ Yellow-rumped . . . . .	[73]	“ Red-headed . . . . .	[53]
“ Yellow-throated . . . . .	[74]	“ Yellow-bellied . . . . .	[53]
Water-Thrush . . . . .	[77]	Wren, Carolina . . . . .	[79]
“ Grinnell's . . . . .	[77]	“ House . . . . .	[79]
“ Louisiana . . . . .	[77]	“ Long-billed Marsh . . . . .	[80]
Waxwing, Bohemian . . . . .	[70]	“ Short-billed Marsh . . . . .	[80]
“ Cedar . . . . .	[70]	“ Winter . . . . .	[80]
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Whistler . . . . .	[35]	“ Greater . . . . .	[42]
Widgeon, American . . . . .	[34]	“ Summer . . . . .	[42]
“ European . . . . .	[33]	Yellow-throat Maryland . . . . .	[77]
Willet . . . . .	[42]	“ Northern . . . . .	[77]
“ Western . . . . .	[42]	<i>ZAMELODIA LUDOVICIANA</i> . . . . .	[68]
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# The American Museum Journal

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## ERRATA.

The Editor regrets the occurrence of the following errors in this Guide, which of necessity was printed in the absence of the author:

Page	85,	line	39	for	Woodcocks	read	Woodcock.
"	88,	"	7	"	Black Gyr Falcon ?	read	Gyr Falcon.
"	90,	"	6	"	White Gyr Falcon	"	Black Gyr Falcon.
"	138,	"	5	"	<i>Iherminieri</i>	"	<i>l'herminieri</i> .
"	143,	"	1	"	<i>albiferons</i>	"	<i>albifrons</i> .
"	143,	"	28	"	<i>Gura</i>	"	<i>Guara</i> .
"	145,	"	1	"	<i>Colurnicops</i>	"	<i>Coturnicops</i> .
"	145,	"	5,	omit	"See group, third floor."		
"	149,	"	37	for	Kildeer	read	Killdeer.
"	150,	"	14	"	<i>pallitus</i>	"	<i>palliatus</i> .
"	152,	"	14	"	Swaison's	"	Swainson's.
"	152,	"	27	"	<i>Haliaetus</i>	"	<i>Haliæetus</i> .
"	159,	"	21	"	Family ALCEDINIDÆ.	Kingfishers	
				read —	Family PICIDÆ.	Woodpeckers.	
"	175,	"	11	for	<i>Progne</i>	read	<i>Progne</i> .
"	179,	"	40	"	<i>domina</i>	"	<i>dominica</i> .
"	183,	"	11	"	<i>Opornis</i>	"	<i>Oporornis</i> .
"	184,	"	11	"	<i>Steophaga</i>	"	<i>Setophaga</i> .
"	187,	"	25	"	<i>mustelina</i>	"	<i>mustelina</i> .
"	188,	"	8	"	<i>Hylocichla bicknelli</i>	read	
					<i>Hylocichla alicia</i>	<i>bicknelli</i> .	

Prefix the asterisk [\*], indicating occurrence in Central Park, to the following species:

Screech Owl,	Gray-cheeked Thrush,
Northern Water-Thrush,	Olive-backed Thrush,
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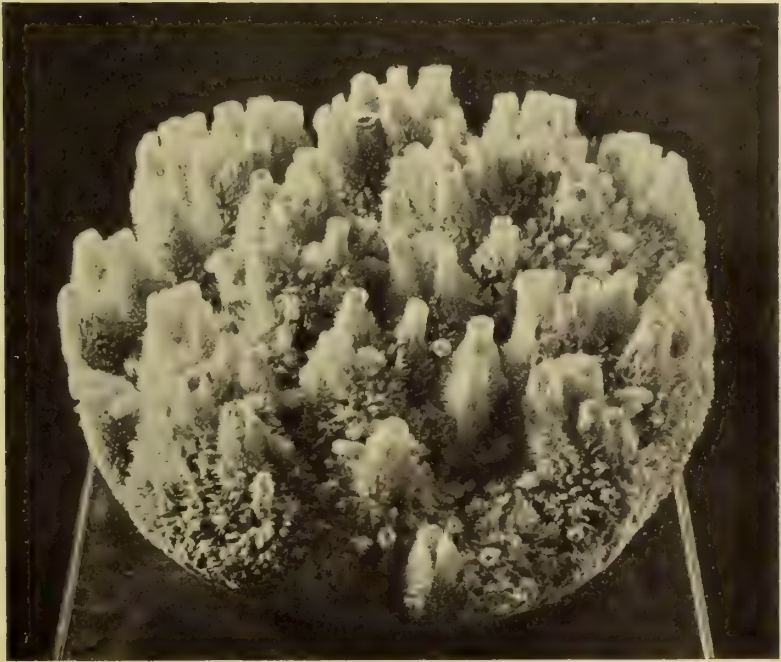
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AMERICAN MUSEUM OF NATURAL HISTORY

# A Guide to the Sponge Alcove



By Roy Waldo Miner

*Assistant Curator of Invertebrate Zoölogy*

REPRINTED FROM THE AMERICAN MUSEUM JOURNAL  
VOLUME VI, No. 4, OCTOBER, 1906

New York: Published by the Museum

Guide Leaflet No. 23

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A GROUP OF LARGE BAHAMA SPONGES

The sponge in front measures 2 feet across. The upper specimen has grown around a tree-like colony of *Gorgonia*, a branching Hydroid. The peculiar chair-like shape of the specimen at the left is noteworthy.

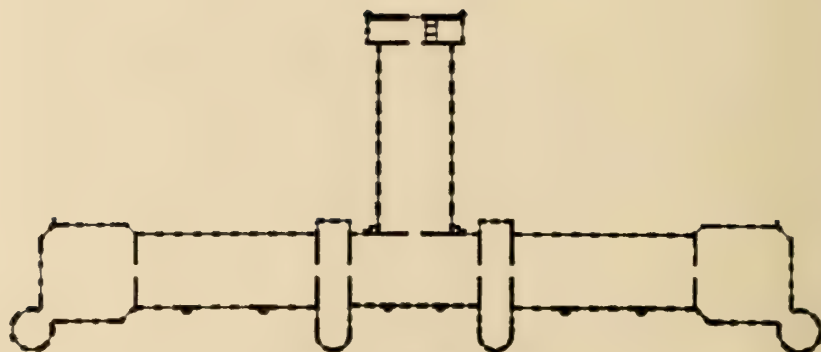


A Guide  
to the  
Sponge Alcove  
in the  
American Museum of Natural History

By  
ROY WALDO MINER

Assistant Curator of Invertebrate Zoölogy

GUIDE LEAFLET No. 23  
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THIRD, OR GALLERY FLOOR.

Key-plan of the Museum building, showing the location of the hall in which the specimens may be found to which references are made in this Guide Leaflet

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## A GUIDE TO THE SPONGE ALCOVE IN THE AMERICAN MUSEUM OF NATURAL HISTORY.<sup>1</sup>

By ROY WALDO MINER,

Assistant Curator Department of Invertebrate Zoölogy.



PONGES are among the most abundant and most widely distributed of sea-animals. With the exception of one family, the fresh-water sponges, they are found in all seas of the globe ranging from shallow waters to beyond a depth of 1,300 feet. The bath-sponges of commerce, with which the word "sponge" is associated in the minds of most people, although from a commercial point of view the most important of the group, form but a single family, *i. e.*, the Spongidæ. The rest of the subkingdom with its great multiplicity of forms is doubtless comparatively unknown to the average person. Even the commercial sponge as it reaches us gives but little idea of what a sponge really is, as it is only the supporting or skeletal part of the animal colony denuded of its fleshy coat of living tissue.

The living sponge is either a single animal or a colony of animals. It is always sessile, that is, attached to the sea bottom, and incapable of locomotion. For this reason it has often been regarded as a plant. But since, in more recent years, its life processes and larval history have become better known, especially since it has come under the eye of the compound microscope, its animal nature has become clearly established.

Sponges show all variations of form, size, and color. There are cake-like sponges, dome-shaped sponges, and fan-shaped sponges. Some are branched like trees; in others the branches reunite to form a complicated network. Some are shaped like huge cups or goblets; some gather in clusters of trumpet- and

<sup>1</sup> Issued also in separate form as Guide Leaflet No 23.

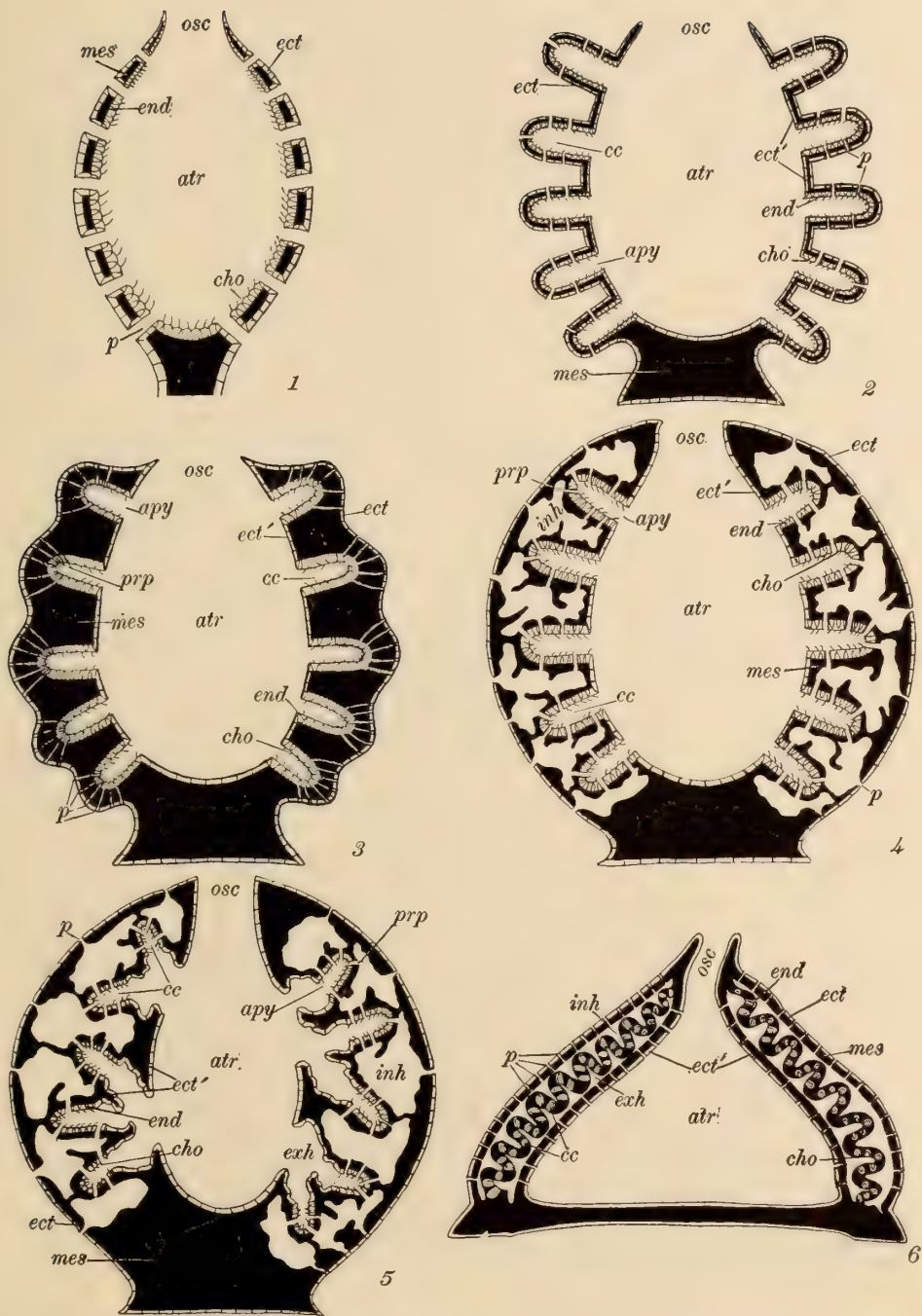
tube-like forms, and even the simplest and most primitive sponges are often shaped like graceful vases. All these forms are found in sizes varying from that of a pinhead to the height of a man.

Their color is as varied as their shape and size. They run through the whole chromatic scale from brilliant red, yellow, and green to the most delicate blue and the deepest violet, in every gradation of shade and tint. Some are pure white, others are shining black, while still others reflect from their opal spicules all the colors of the rainbow.

As the form and color of sponges, however, may vary as much among members of the same species as among those of different species these factors cannot be depended on for classification. The same sponge which in deep water shows the branching habit, in shallower water appears as a flat encrusting colony; or a sponge which has a symmetrical vase-like form, many feet below the surface of the sea, where it is little disturbed by outer influences, may be of the same species as an irregular one-sided mass growing in shallow water or in the crevice of a rock. Again a sponge usually dome-shaped may send out a finger-like process from its upper surface which becomes branched and unites with the branches of other finger-like processes. In other words external form in sponges is not a constant or essential factor. It is purely a matter of environment, in which gravity plays an important part. This tendency to vary has made the arrangement of sponges in an orderly and natural system, a difficult task, much complicated by the fact that for many years classification has been wrongly based upon these very factors. Since, however, the microscope has been developed to its present perfection, it has been found that the arrangement of the skeleton and the form of the spicules or skeletal units, together with the structure of the canal system, furnish more constant data for classification. This can be brought out more clearly in discussing the anatomy of the sponge.

#### ANATOMY.

In considering the anatomy of sponges it is sufficient for our purpose to concern ourselves with:



FIGS 1.—6—DIAGRAMS ILLUSTRATING CANAL SYSTEMS IN DIFFERENT TYPES OF SPONGES (after Schulze).

1. Ascon type; 2-5. Variations of Sycon type; 6. Rhagon type; *ect.*, ectoderm of exterior; *ect'*, ectoderm of atrial cavity; *mes.*, mesoderm; *end.*, endoderm; *osc.*, osculum; *atr.*, atrial cavity or cloaca; *cho.*, choanocyte layer; *cc.*, flagellate chambers; *p.*, pores; *prp.*, prosopyles; *apy.*, apopyles; *inh.*, inhalent cavities; *exh.*, exhalent cavities.



1. General Structure,
2. The Canal Systems,
3. The Skeleton.

1. *General Structure.*

This is best shown by the description of a simple sponge in which the general characteristics of the subkingdom predominate, unmodified by special conditions.



FIG. 7.—AN EXAMPLE OF THE BRANCHING HABIT

The simplest, most primitive, and at the same time most typical sponge is *Ascetia primordialis*, first described by Hæckel

(See Fig. 1.). This sponge is typically vase-like in external form. The circular opening at the top of the vase is known as the *osculum* (*osc.*) in spite of the fact that it is excretory and has neither structurally nor functionally the characteristics of a mouth.

The walls of the vase are perforated with numerous regularly arranged openings or pores (*p.*) which open directly into the hollow interior of the sponge—called the *paragastric* or *atrial cavity* (*atr.*). The walls are made up of three layers: 1st, the ectoderm, or outer layer; 2d, the endoderm, or inner layer; 3d, the mesoderm, or middle layer.

The *ectoderm* (*ect.*) is a thin layer of cells, generally arranged in mosaic form and known as "pavement cells." In the case of this species, however, the walls of the cells have disappeared and left the protoplasmic cell-contents continuous over the entire surface of the animal. Such a layer is called a *syncytium*.

The *endoderm* (*end.*) lines the paragastric cavity and is made up of a layer of peculiar and characteristic cells called "collared cells," or *choanocytes* (*cho.*), found nowhere else among many-celled animals. They are so called from a collar-like rim around the outer edge of the cell out of which extends a long whip-like

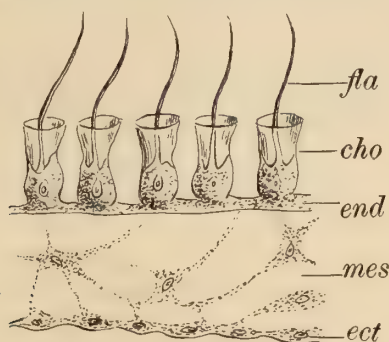


FIG. 8.—SECTION THROUGH SPONGE WALL

*ect.*, ectoderm; *mes.*, mesoderm; *end.*, endoderm; *cho.*, choanocytes or "collared cells"; *fla.*, flagellum.

filament or *flagellum* (*fla.*). The continuous vibration of these flagella produces a current by means of which the sea-water, with its multitude of tiny animal and plant forms, is sucked in through the pores. The organisms are then seized upon by the

choanocytes and their digestible parts absorbed. What is left is discarded and flows with the current out through the osculum at the summit of the vase.

The *mesoderm* (*mes.*) is a thin jelly-like layer between the ectoderm and endoderm. It contains scattered amœboid cells and the reproductive elements, and is the origin of the skeleton.

## 2. The Canal Systems.

In the form of sponge just described the mesoderm is extremely thin, but if, as in the majority of sponges, there is a greater or less thickening of this layer, the pores will no longer be perforations, but will become transformed into tubes or canals



[FIG. 9.—A SYCON SPONGE (*Grantia ciliata* Fleming) GROWING ON A MUSSEL SHELL  
Star-shaped colonies of the Ascidian *Botryllus* are also growing on the same shell.

(See p. 221, Fig. 3), which may branch and be modified in various ways. This gives rise to three general types of sponges which are therefore based mainly on the arrangement and variations of the pore- and canal-systems. These are known as

- (a) The Ascon Type,
- (b) The Sycon Type,
- (c) The Rhagon Type.

(a) *The Ascon Type* (p. 221, Fig 1.). This type is characterized by sponges having walls with a thin layer of mesodermal tissue (*mes.*), and therefore, with pores (*p.*) opening directly from the outside into the paragastric cavity (*atr.*). The endoderm (*end.*) is always continuously lined with choanocytes or "collared cells" (*cho.*). *Ascetta primordialis*, therefore, is the representative of this group. Another example is *Leucosolenia*, of which a specimen may be seen in this alcove. A complication of this type is shown by *Homoderma*, which differs from *Ascetta* in having its surface broken up by a multitude of radially arranged thimble-like prolongations or diverticula, each with a central cavity of its own, opening into the main paragastric cavity of the sponge and lined with a continuation of the endoderm with its collared cells. In this case the pores are found only in the walls of the diverticula.

(b) *The Sycon Type* (p. 221, Figs. 2-5; p. 224, Fig. 9). In this type, as in the example just described (*Homoderma*), the walls of the paragastric cavity are prolonged into radially arranged branches called *radial tubes* (*cc.*) but the choanocytes, instead of lining both the paragastric cavity and the radial tubes, are found only in the latter, while the former is invested with a layer of epidermal "pavement cells" (*ect.*) like the outside of the sponge. The mouth of the radial tube by which it opens into the central cavity is called the *apopyle* (*apy.*). In the simpler sponges of the Sycon type, such as *Sycon ciliatum*, the pores open directly into the radial tubes (Fig. 2) and the outer surface of the sponge is covered with papillæ corresponding to the cavities within. In these forms, the mesoderm (*mes.*) continues to be thin. In other forms, however, the mesoderm becomes greatly thickened and completely fills the spaces between the radial tubes (Fig. 3) so that the outer surface appears comparatively smooth and free from papillæ. Under these circumstances the pores cannot open directly from the outside into the radial tubes, so they lengthen into *inhalent canals* traversing the mesoderm. In still other forms (Fig. 4) the canals have enlarged to wide cavities or *inhalent lacunæ* (*inh.*) opening to the outside by the pores and into the radial tubes by openings called *prosopyles* (*prp.*). Another complication occurs in the Leucons where the walls of the para-



gastric cavity become folded in such a manner that the radial tubes lose their radial position and open into the folds or their branches (Fig. 5, *cc.*). The openings by which the folds communicate with the paragastric cavity may then become narrowed and thus large irregular spaces called *exhalent lacunæ* (*exh.*) are formed, with the result that the radial tubes become mere tubular chambers (*cc.*) communicating at the open end with the paragastric cavity (*atr.*) only by the intervention of the inhalent lacunæ (*inh.*), which in turn communicate with the outside by the pores. As both the inhalent and exhalent lacunæ are lined

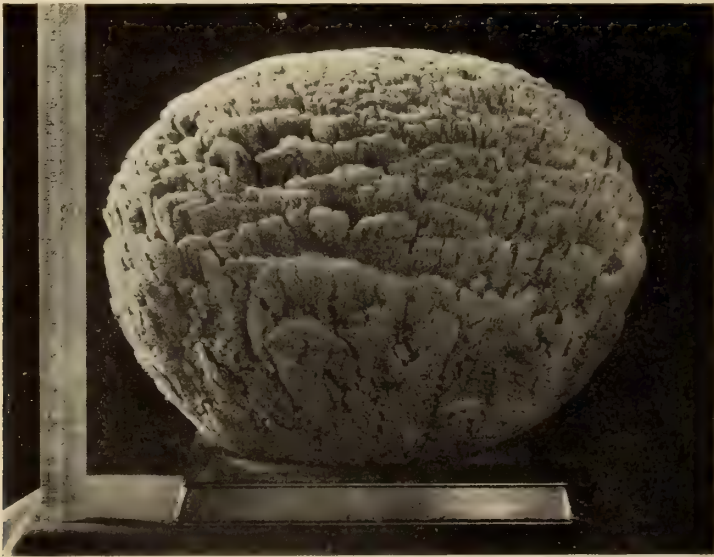


FIG. 10.—A LARGE BAHAMAN SPONGE (*Hippospongia cerebriformis* D. & M.)

with "pavement cells" (*ect.*) the choanocytes become restricted to the tubular *flagellate chambers*, as the radial tubes are now called.

(c) *The Rhagon Type* (p. 221, Fig. 6). The two preceding types of canal arrangement are peculiar to the sponges having a calcareous or carbonate of lime skeleton. The great majority of sponges, including those having "glass" skeletons, horny skeletons or no skeletons at all, belong to the Rhagon type. In this case the flagellate chambers (*cc.*) are very small and numerous and, instead of being tubular, are spherical. The mesoderm varies





FIG. 11.—NON-COMMERCIAL HORNY SPONGES (*Stelospongia* sp.)  
A trumpet-like form showing plainly the *principal fibers* projecting around the rim,  
and the *oscula* or excurrent openings lining the cavity of the specimen.

greatly in thickness, and the canal system may become much complicated through the folding of the walls of the paragastric cavity and the development of wide mesodermal cavities (*inh.* and *exh.*).

### 3. The Skeleton.

One of the most remarkable features of sponge structure is the skeleton. It is by far the most reliable basis for classifying the sponges yet discovered, inasmuch as it is comparatively unaffected by the external surroundings of the individual and



FIG. 12.—A BAHAMAN COMMERCIAL SPONGE (*Hippospongia* sp. Hyatt)  
Showing colony of tube-like individuals

therefore its peculiar features remain constant to the groups of which they are characteristic. It may be composed either of fibers or spicules, and it is secreted by the mesoderm. Its function is to furnish a rigid supporting framework for the body and to act as a protection against the enemies of the sponge.

The fibrous sponges include among others those known to commerce. The skeleton is, in most cases, made up of interlacing and anastomosing fibers of a horny substance called *spongin*,

closely akin to silk in chemical composition. It is secreted by the mesoderm and is arranged so as to be a supporting basis to the layers of cellular tissue composing the soft parts of the animal. The fibers are of two kinds,—first, a set of long stout *principal fibers* (see Fig. 11), from  $\frac{1}{2}$  to  $\frac{1}{10}$  mm. in diameter, radiating from the base of the sponge to its surface, and secondly, a complicated network of fine *connective fibers* interlacing between the principal fibers and supported by them. The connective fibers are extremely delicate, having a diameter of only .01 to .02 mm. and with meshes scarcely as large as their diameter. Grains of sand are often found imbedded in the principal fibers, in some cases forming a considerable part of the skeleton, in others the entire substance. The spongin fiber is made up of a soft central core



FIG. 13—SOME TYPICAL FORMS OF SPONGE SPICULES

or *medullary axis*, surrounded with successive layers of the spongin substance. The classification of the horny sponges is based upon the minute characters of the network. A few sponges of small size have no skeleton at all, being supported by whatever rigidity their tissues may possess, but with these exceptions all except the horny sponges have skeletons made up of *spicules* instead of fibers. These are small needle-like bodies composed of either carbonate of lime or silicon. The latter is found combined with water in such proportions as to form a substance chemically resembling opal, and of transparent glassy appearance. Hence spicular sponges may be classified as calcareous or silicious according to the nature of their skeletons. Spicules may have one or two axes, or their axes may radiate in 3, 4, 5, 6, or even 8 different directions, and are found in a great variety of forms,

some of which are shown in Fig. 13. Those having one or two axes may be straight, curved, or bent at various angles. They may be pointed, rounded or knobbed at one or both ends. They may be smooth or spined. Spicules having a greater number of axes may also have their arms pointed, rounded or knobbed, or each arm may be branched, either once or twice, or to such a degree as to present a great variety of star-like figures. Spicules occasionally assume extremely odd shapes. Some look like tiny cuff-buttons, others like anchors, horseshoes and hooks of peculiar design, while still others are coiled like springs. As regards size they may be divided into two classes:



FIG. 14.—A DICTYONID SPONGE (*Farrea occa* Carter)  
With rigid lattice-like skeleton.

*megascleres*, or large spicules, and *microscleres*, or small spicules. The megascleres form the main supporting structure of the skeleton and are bound together in long fiber-like bundles which are either parallel, or cross each other so as to form triangular or square meshes. They are sometimes entangled and interlaced in all directions like felt, clinging to each other with their hooks and projections. In the Dictyonid sponges (Fig. 14) the megascleres are of three axes at right angles to each other and are arranged with points overlapping. During the life of the sponge these



grow together and finally form a perfectly rigid network. The microscleres on the other hand are not supporting in function. In fact in most cases their use is unknown. They are found embedded in the fleshy parts of the sponge and are so minute as to be distinctly visible only under a high power of the microscope. They are extremely valuable in determining species.

#### REPRODUCTION AND DEVELOPMENT.

Sponges may reproduce either by budding (*asexual reproduction*), or by means of eggs (*sexual reproduction*). Reproduction by budding is brought about by an outgrowth of cells from the side of the sponge involving all three layers. This finally develops



FIG. 15.—FRESH WATER SPONGES (*Spongilla* sp.)

into a miniature of the parent sponge, as far as structure is concerned, becomes narrowed at the base until it is only attached by a stem, and finally drops off. It then becomes fixed to the sea-bottom and grows to maturity. Sexual reproduction on the other hand is only effected by the union of sexual elements within the tissues of the parent sponge. The male and female reproductive cells originate in the mesoderm of the same individual and unite to form the fertilized unicellular egg. The larva is developed from the one-celled stage, by a process of cell division or cleavage. It passes through 2-, 4-, and 8-celled



stages by vertical divisions, at the end of which time it appears as a circular disc divided into eight equal segments. These again divide into a 32-celled stage by means of a horizontal or *equatorial* cleavage, and then, by repeated divisions of the eight upper cells, a hollow sphere is formed composed of eight large granular cells and many small cells, each of the latter bearing a long flagellum or whip-like filament. The eight large cells divide more slowly, always remaining comparatively large, and are not provided with flagella.

At this so-called *blastula* stage the larva issues from the



FIG. 16.—A GROUP OF NEPTUNE'S GOBLET SPONGES (*Poterion neptunei* Harting.)  
The tallest specimen is 33 inches high.

endoderm of the parent and finally passes out through the osculum of the sponge. It swims rapidly about with its flagellate portion in front, and after a time the large granular cells grow around and enclose the flagellate cells. Soon a cup-shaped body is formed, known as the *gastrula*, which is covered with non-flagellate cells, and lined with a multitude of flagellate cells. The opening of the cup, or *blastopore*, now narrows and almost immediately the larva settles down and becomes fixed by the rim of the blastopore to a rock or some other object. The development is now very

rapid. The blastopore closes; the flagellate cells develop collars and become choanocytes; the osculum or excretory opening perforates the free end; the side walls are pierced with pores; traces of the skeletal spicules begin to show in scattered mesodermal cells as tiny needles of glass or carbonate of lime; and the body assumes a somewhat cylindrical shape. From now on the animal possesses all the elements of a true sponge, and growth proceeds according to its nature and environment.

#### PHYSIOLOGY.

This subject, in its application to sponges, is very imperfectly known.

The following facts, however, can be definitely stated:

The adult sponge is attached and is incapable of locomotion. Its only outward movements seem to be a slow dilatation and contraction of the pores and the osculum.

The choanocytes, however, are very active. The flagella are in constant vibration, and the collars are continually expanding and contracting. These cells are the chief organs of nutrition and respiration. The motion of the flagellum creates a whirlpool, by means of which the sea-water and the organisms it contains are sucked down within the collar. The cell then seizes upon, and absorbs the digestible organisms, while the constantly renewed sea-water, being brought into closer relation with the absorbing tissues, causes the necessary oxygenation to take place.

Excretory products are, without doubt, cast out by these cells and together with the indigestible organisms are borne out through the osculum by the main current of sea-water.

It is also said that during the winter many choanocytes disappear, to be restored in the spring-time. Thus a kind of hibernation seems to occur.

The growth of sponges is slow, five or six years being necessary to bring them to their full size. This, however, is very variable.

There is no muscular or nervous system. Instead, there is what has been called a "vague general sensibility" of the whole

sponge. This shows itself particularly in the movements of the osculum and pores.

Sponges may grow together if placed in contact, or, on the other hand, fragments cut from a sponge can be made to live and grow separately. This peculiarity is utilized in connection with the artificial propagation of the commercial sponges. Sponges do not, however, regenerate parts which have been cut off, although the original sponge may go on growing as if nothing had happened.

#### POSITION OF SPONGES IN THE ANIMAL KINGDOM.

The relation of sponges to other animal forms has always been very uncertain. The choanocytes of the endoderm seem to connect them with a group of colonial Protozoa known as *Choanoflagellates*. These are the only other animal forms which have "collared cells." In fact certain colonies of Choanoflagellates (*Proterospongia*) very much resemble primitive sponges. On the other hand sponges have often been grouped with the Coelenterates, on account of the resemblance of the planula and gastrula larval stages to those of the Jellyfishes; because of the fixed condition of the adult, the simple structure and the sac-like internal cavity; as well as the supposed resemblance of the osculum to the Coelenterate mouth. The latter resemblance is only apparent, however, as the osculum does not function as a mouth, nor does it have the same embryological history. Sponges, moreover, differ widely from Coelenterates in their lack of tentacles and "sting-cells," or *nematocysts*, and are peculiar in having pores, "collared cells," and spicular skeletons. These differences are so important that it has been necessary to recognize the sponges as a separate subkingdom, most probably having a common ancestry in some group immediately derived from the Protozoa.

#### CLASSIFICATION.

On account of the difficulties besetting sponge classification many very widely differing schemes have been proposed. The earliest were based largely on external forms and the chemical

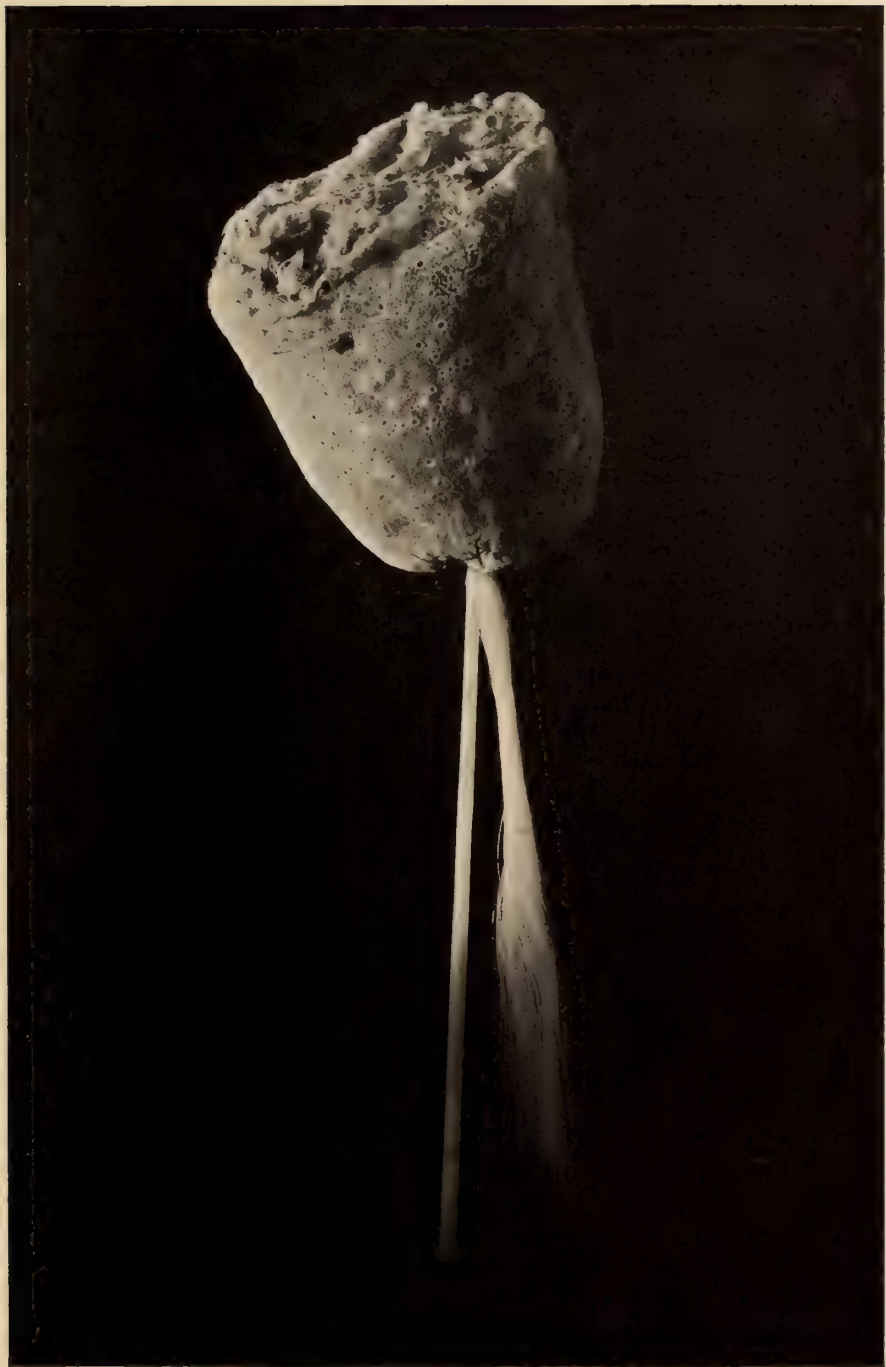


FIG. 17.—A GLASS ROPE SPONGE (*Hyalonema sieboldii* Gray)

The twisted rope-like bundle of opal spicules projecting from the base of the sponge, forms a supporting structure in life, the lower end being embedded in the mud.



composition of the sponge skeleton. The latter basis is still used for the division into classes, but the former has been for the most part abandoned on account of the plastic nature of the framework of sponges and the consequent variability of their growth-habits. Such internal features as the form and arrangement of the spicules, the extent of the choanocytic layers, and the general plan of the canal system, seem to be more constant characters, and are utilized in all recent classifications. There is, however, much variability among internal characters also, and there are yet many perplexing problems to the spongologist, especially on account of the great number of intermediate forms and unexpected relationships. In fact a genealogical diagram of the sponges would not so much resemble a branching tree, as a network with connecting fibers anastomosing in all directions, and most probably approximating in its appearance the bewildering skeletal labyrinth of the fibrous sponge itself. The following synoptic table, modified from Delage and Herouard, seems to be for the most part in harmony with recent researches, and as likely as any to have some degree of permanence, as it is largely based on internal structure, *i. e.* the skeleton and canal systems:

## PORIFERA.

No nematocysts, no mouth, but with inhalent pores; a cloacal atrial cavity with a simple or multiple osculum; a mesoderm.

### A. Class CALCAREA. Spicules calcareous; choanocytes large.

- a. Order **HOMOCCELIDA**. Atrial cavity lined with choanocytes. (*Leucosolenia*,\* *Ascetta*, *Ascyssa*, *Homoderma*.)
- b. Order **HETEROCCELIDA**. Atrial cavity lined with pinacocytes (pavement cells), the choanocytes being withdrawn into radial diverticula or ciliated chambers. (*Sycon*, *Grantia*,\* *Ute*, *Barroisia*, *Leucilla*, *Leucandra*, *Eilhardia*, *Eudea*, *Petrostoma*.)

### B. Class NON-CALCAREA. Skeleton of silicious spicules, or of spongin fibers or no skeleton. Choanocytes small.

- i. Subclass **TRIAXONIÆ**. Ciliated chambers large, elongated; skeleton of triaxial spicules or none.
  - a. Order **HEXACTINELLIDA**. Skeleton formed of spicules.
    - (1) Suborder **LISSACINA**. Spicules independent during growth. (*Euplectella*,\* *Askonema*, *Rosella*, *Lophocalyx*, *Hyalonema*,\* *Semperella*.)
    - (2) Suborder **DICTYONINA**. Spicules united during growth to form a rigid trellis-work. (*Farrea*,\* *Aphrocallistes*,\* *Hexactinella*,\* *Dactylocalyx*, *Ventriculites*, *Cæloptychium*.)

\* Represented in Museum Collection.



- b. Order **HEXACERATIDA**. Skeleton formed of fibers, or no skeleton. (*Darwinella*, *Aplysilla*, *Halisarca*.)
2. Subclass **DEMOSPONGIÆ**. Ciliated chambers small; skeleton formed of spicules of one or four axes; or no skeleton.
- a. Order **TETRACTINELLIDA**. Skeleton formed of tetraxial megascleres, rarely reduced to microsccleres, or no skeleton at all.
- (1) Suborder **CHORISTINA**. Skeleton flexible, without interlocking desmas.
- (i) Family **Sigmatophoridae**. Megascleres present. Microsccleres in the form of sigmaspires, or none. (*Tetilla*, *Cinachyra*.)
- (ii) Family **Astrophoridae**. Megascleres present. Microsccleres in the form of asters. (*Thenea*, *Stelletta*, *Disyringa*, *Geodia*, *Pachymatisma*.)
- (iii) Family **Microsclerophoridae**. No microsccleres. (*Plakina*, *Oscarella*, *Chondrosa*.)
- (2) Suborder **LITHISTINA**. Skeleton rigid, formed of interlocking desmas
- (i) Family **Triænidæ**. Ectosome containing triænes. (*Theonella*, *Desmanthus*, *Siphonia*, *Corallistes*, *Pleroma*.)
- (ii) Family **Rhabdosidæ**. Ectosome containing microstrongyles, free or in desmas. (*Neopelia*.)
- (iii) Family **Anoplidæ**. Ectosome without spicules. (*Azoria*, *Vetulina*.)
- b. Order **MONAXONIDA**. Skeleton formed of megascleres of only one axis.
- (1) Suborder **HADROMERINA**. Ordinarily with a cortex; megascleres in radial bundles; microsccleres in asters or absent, never in the form of spires or sigmas.
- (i) Family **Aciculidæ**. Diactinous megascleres. (*Tethya*, *Hemisterella*, *Stylocordyla*.)
- (ii) Family **Clavulidæ**. Monactinous megascleres. (*Spirastrella*, *Suberites*,\* *Polymastia*, *Cliona*.)
- (2) Suborder **HALICHONDRINA**. Ordinarily no cortex; megascleres entirely oxeas arranged in a network. (*Spongilla*\*, *Chalina*\*, *Reniera*, *Halichondria*, *Tedania*, *Esperella*, *Cladorhiza*, *Myxilla*, *Clathria*, *Axinella*\*)
- c. Order **MONOCERATIDA**. Skeleton formed of spongin fibers with or without microsccleres. (*Euspongia*\*, *Hippospongia*\*, *Aplysina*\*, *Druinella*, *Stelospongia*\*, *Hircinia*\* *Spongelia*\*, *Phoriospongia*\*)

\* Represented in Museum Collection.

## TYPICAL SPONGES IN THE MUSEUM.

### A. CALCAREOUS SPONGES (CLASS CALCAREA)

The most conspicuous characteristic of this class is the calcareous or carbonate of lime skeleton. The class is divided into two groups, the first containing those sponges whose hollow interior (paragastric cavity) is entirely lined with "collared cells" (order Homocœlida), the second comprising those in which the "collared cells" are confined to thimble-like prolongations of the paragastric cavity (order Heterocœlida).

An example of the **Homocœlida** is the Ascon sponge *Leucosolenia primordialis* Hæckel. The genus to which this species belongs is found in all seas to a depth of 6000 feet. Its manner of growth varies from solitary, erect, cylindrical sponges to encrusting colonies of serpent-like tubes ramifying in a complicated network. Sometimes the whole colony assumes an erect vase-like form with walls made up of entwining tube-like individuals. The sponge on exhibition is of the encrusting type, growing in this instance on a colony of barnacles.

The Sycon sponge, *Grantia ciliata* Fleming, represents in the exhibition the order **Heterocœlida**. This is a common species found all along the New England sea-coast. It is a small tubular sac with the osculum surrounded by a circle of finger-like spicules, as shown in the illustration on page 224. It grows from an inch to an inch and a half in length, in small cluster-like colonies attached to sea-weed, submerged timbers, shells, etc. The specimens in the glass jar are growing on a mussel shell which is also partly encrusted with small star-shaped colonies of the interesting Ascidian, *Botryllus*.

### B. THE NON-CALCAREOUS SPONGES (CLASS NON-CALCAREA).

The sponges of this class have no traces of carbonate of lime in their skeletons. Instead some contain silicious spicules



FIG. 18.—A RARE "GLASS" SPONGE (*Hyalascus similis* Ijima)

This graceful specimen illustrates the vase-like growth of many sponge colonies  
(Height, 15 inches.)

(the so-called "glass" sponges), or their skeletons may be partly or entirely made up of a network of spongin fibers. A few sponges have no skeletons at all.

Those sponges which have six-rayed spicules belong to the order **Hexactinellida**, a group marked by forms of unusual beauty and grace, of which a fine collection is shown in this alcove. In some of these (suborder Lissacina), the spicules are independent during growth and are felted together by means of their hooks and spines; in others (suborder Dictyonina), the overlapping ends of the spicules have grown together to form a rigid lattice-like framework.

*Suborder Lissacina.*—The several species of *Euplectella* (Venus's Flower-basket) are especially noticeable for delicate beauty, while *Walteria* is remarkable for its odd tree-like form. *Acanthascus*, *Rhabdocalyptus* and *Crateromorpha* are also represented by fine specimens, (see opposite page) and give a good idea of the variety of forms which these sponges may assume, while the remarkable vase-like *Hyalascus similis* Ijima (Fig. 18, p. 239) is not only the type of its species, but is the only specimen known to have been found.

The so-called "glass-rope" sponges (*Hyalonema*) are remarkable for the twisted, cylindrical bundle of elongated spicules projecting from the lower end. In life this stalk-like support is anchored in the mud at the sea-bottom by means of barbs and hooks at the lower end of the spicules. An interesting peculiarity of this sponge is its association with tiny Zoöphytes (*Palythoa*) which are always found growing upon its stem (see Fig. 22). This is an illustration of the phenomenon of *symbiosis*, indicating an association of two animal forms for their mutual advantage.

*Suborder Dictyonina.*—The two specimens of *Farrea occa* Carter (see Fig. 14, p. 230) and *Aphrocallistes* show particularly well the lattice-like framework peculiar to this group, and also the characteristic manner of growth of these sponges.

The glass sponges are all universally distributed in the deep waters of tropical seas. Most of the specimens exhibited in this Museum were collected in the Sagami Sea, an arm of the Sea of Japan. This is a particularly favorable locality, as the sea-bottom falls away rapidly to a great depth close to the shore,





FIGS. 19-22.—SOME TYPICAL "GLASS" SPONGES

FIG. 19.—A tree-like species (*Walteria leuckhardtii* Ijima).

FIG. 21.—Venus's Flower-basket (*Euplectella speciosissima* Owen).

FIG. 20.—The Cactus Sponge (*Acanthascus cactus* Schulze).

FIG. 22.—A "Glass-rope" Sponge (*Hyalonema owstoni* Ijima) with *Palythoa* growing on stem.



thus giving an opportunity for deep sea forms to stray up into comparatively shallow water.

The native method of collecting these sponges is interesting. An apparatus called a "dabo line" is used. This is a long line about an eighth of an inch in thickness, to which smaller branch lines or "snoods" are attached at short intervals. Each "snood" ends in a brass or iron wire hook with a barbed point. The "dabo lines" are coiled in baskets placed in the bottom of a boat manned by five or six men. The hooks are stuck in a row around the edge of the basket, and as the line is uncoiled, are successively unfastened by one of the men. The line is set by tying one end to the end of a long rope weighted with a stone sinker. The latter is then lowered perpendicularly, carrying the "dabo-line" with it, until the required depth is reached, when the upper end is moored to a buoy. The boat is then rowed away until the entire "dabo line" is paid out, when it is attached to another strong rope also weighted, which is lowered in the same manner as the first, and moored to a buoy. After a time the line is taken up, beginning at the first buoy, when sea-animals of all kinds including many "glass" sponges are found either hooked or entangled in the "snoods."

The order **Tetractinellida** comprises living and fossil forms, the skeletons of which are composed of four-rayed spicules.

The fossil Tetractinellids and other sponges are well shown in the Geological Hall, fourth floor, north wing of this building. *Hyalotrogos*, *Cnemidiastrum*, *Leidorella* and *Callopegma* are a few of the genera illustrated by the specimens.

The next great division of sponges, the order **Monaxonida**, comprises sponges having large spicules of but one axis. Sometimes these are arranged in radiating bundles and sometimes form a network. The species are quite numerous and universally distributed. The most remarkable of these sponges are the giant Neptune's Goblets (*Poterion neptunei* Harting), three fine specimens of which may be seen in a special case at the farther end of the alcove. At the left of these, another large cup-like Monaxonid sponge fished up near Santa Lucia, West Indies, may also be seen. This specimen (see opposite page) is remarkable for its size and beauty, for the peculiar irregular knob-like

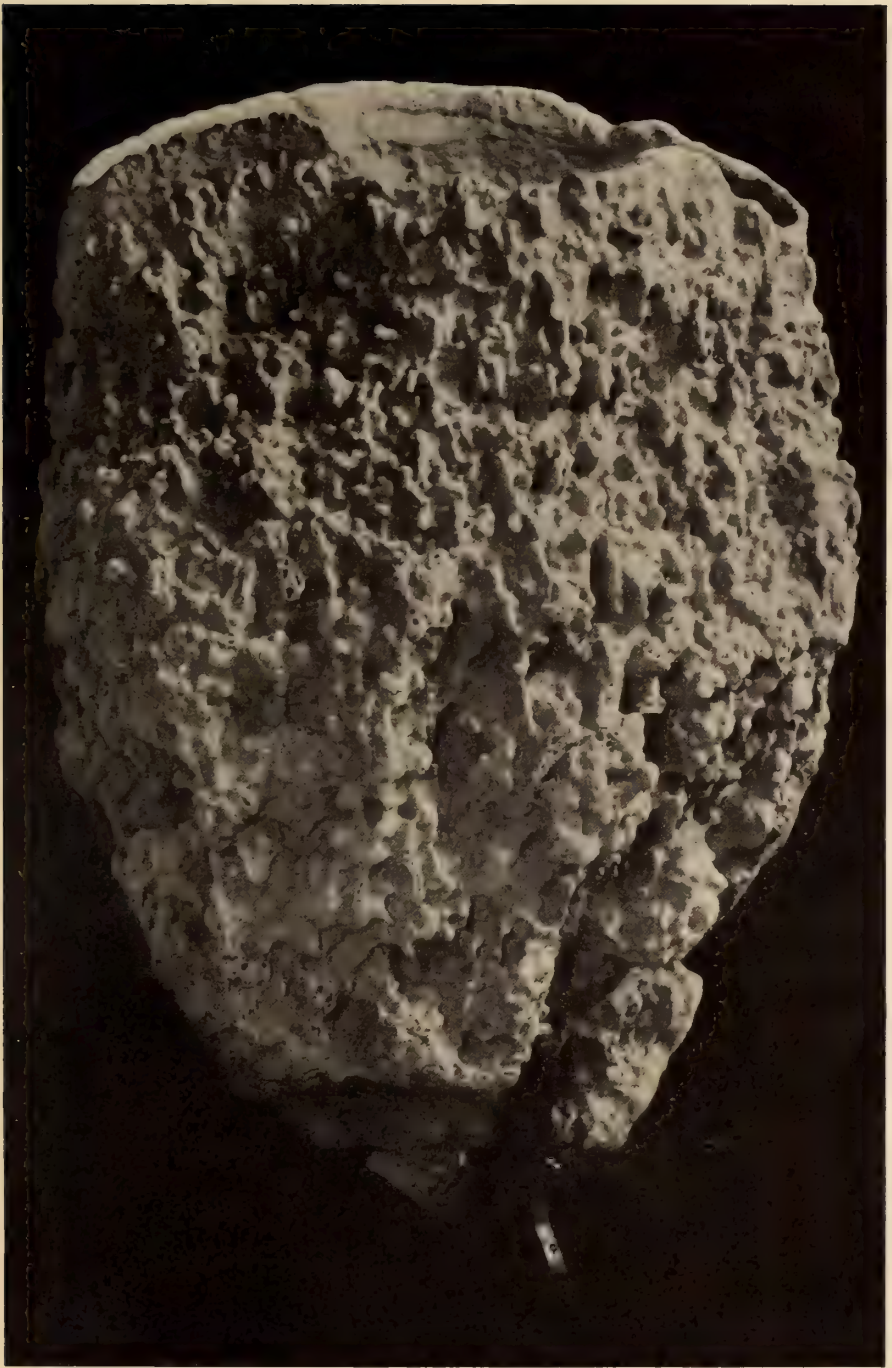


FIG. 23.—A REMARKABLE VASE-LIKE MONAXONID SPONGE  
From Santa Lucia, W. I. (Height  $31\frac{1}{2}$  inches).

projections on its surface, and for its very fragile texture. Other noteworthy specimens belonging to this order are as follows:

*Spongilla* sp. (illustrated on page 231.)—This is an example of the fresh-water sponges which form the only exception to the rule that sponges are marine animals. In color it is usually yellowish, often tinged with green or brown. It is universally distributed in streams and ponds.

*Pachychalina*.—This genus consists of usually elongate, finger-like and branching sponges in which the spicules are buried in a horny coating of spongin. The numerous excretory openings, or oscula, are conspicuously scattered over the external surface.



FIG. 24—THE STOLON-BEARING SPONGE (*Siphonochalina stolonifera* Whitfield)  
A peculiar adaptation of the branching habit.

*Siphonochalina*.—This is closely related to the preceding genus, but consists of a group of tube-like individuals varying in form, and with spongin of somewhat paper-like texture. This genus is represented by several species, of which *Siphonochalina stolonifera* Whitfield is the most remarkable. This beautiful sponge is illustrated in the above cut of the type specimen. It consists of a number of tubes with crown-like summits, growing



FIG. 25.—THE TRUMPET SPONGE (*Tuba plicifera* Hyatt.)



from a common base, and connected with each other by root-like stolons, which form the attachments to the rocks on which they grow. The texture of the skeleton is very fine and smooth.

*Tuba*.—The genus *Tuba* is represented by two species *T. bullata* and *T. plicifera*. These are more or less trumpet-shaped as the name implies. The specimen illustrated on page 245 is especially fine.

The Horny Sponges (order **Monoceratida**) includes the sponges whose skeletons are entirely made of the spongin substance. The most typical and most important of these are the commercial

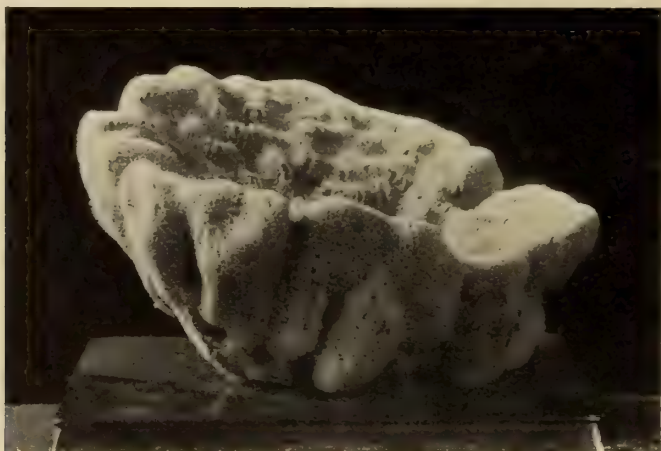


FIG. 26.—THE ZIMOCCA SPONGE (*Euspongia zimocca* Schulze)

sponges. They are divided into the genera *Euspongia* and *Hippospongia*. In addition to these the fine finger-like sponges of the genus *Chalinopsilla*, the black branching skeleton of *Hircinia atra* Whitfield (type) and the graceful cup-like specimens of *Stelospongia* (see illustration on page 227) are worthy of note, although they possess no commercial value.

#### THE COMMERCIAL SPONGES.

The sponge of commerce is the elastic horny skeleton of spongin from which all the living tissues of the animal have been removed. The principal sources of supply are:





FIGS. 27-30.—FOUR GRADES OF AMERICAN COMMERCIAL SPONGES.

FIG. 27.—The "Velvet" Sponge (*Hippospongia meandriiformis* D. & M.).

FIG. 28.—The Florida Yellow Sponge (*Euspongia coriaria* D. & M.).

FIG. 29.—The "Sheep's Wool" Sponge (*Hippospongia gossypina* var.

FIG. 30.—The Yellow Sponge (*Euspongia graminia* Hyatt).

*hirsuta* Hyatt).

- (1) The Mediterranean coast, including the gulfs, bays and islands from Italy to the Levant, and the whole African shore.
- (2) The Bahamas, Florida, and the north coast of Cuba.
- (3) Australia and a few of the Pacific Islands.

There are three grades of European sponges, *i. e.*, the Turkey or Levant Sponge, the Horse Sponge, and the Zimocca Sponge.



FIG. 31.—THE SYRIAN SILK SPONGE (*Euspongia officinalis* var. *mediterranea* Schum.)  
The finest quality of Mediterranean sponge.

The Turkey or Levant Sponge (*Euspongia officinalis* var. *mediterranea* Schum.) is shown in the illustration. It is the finest grade of sponge known. Its texture is very soft, fine and silky. On account of the latter quality it is often called the Syrian Silk Sponge. This same species grows in Florida but is of very poor quality, probably on account of the climate and other differences in its surroundings.

The next grade of Mediterranean Sponge is the Horse Sponge (*Hippospongia equina* O. S.). Its quality is very fine and is paralleled on the Florida coast and in the Bahamas by the Velvet

and Sheep's-wool Sponges (*Hippospongia meandriiformis* D. & M. and *H. gossypina* Hyatt). These are the best of American bath-sponges. (Figs. 27 and 29).

The third grade, the Zimocca Sponge (*Euspongia zimocca* F. E. Schulze), is not as soft as the others, and corresponds to the Florida Yellow Sponge or "Hardhead." (Figs. 26 and 28).

The Grass Sponge (*Euspongia graminea* Hyatt. Fig. 30) is the poorest grade of American sponge and is of little commercial value.

Sponges grow attached to rocks and other objects at the sea-bottom. They are obtained in shallow water by means of long iron hooks, which, however, often damage the sponges by tearing them. The most perfect specimens as well as the largest are obtained at greater depths by divers. The Dalmatian fishermen are very skilful at this. The diver is stripped and has a small rope attached to his waist weighted with a slab of stone. He seizes the stone in his hands and dives to the bottom. A skilful diver can remain under water for two to three minutes, during which time he quickly gathers whatever sponges he can find and places them in a net attached to his neck. He is then quickly drawn to the surface. Diving by this method is confined to the summer season, as the winters are too cold for such work. The Greek divers use a water-glass to locate their sponges. This is a metal cylinder somewhat longer than a band-box, open at the top and closed at the bottom by a plate of glass. By holding the glass-covered end below water, a person looking through it can easily see the bottom at a depth of 180 feet. The divers work in regulation diving-suits supplied with air from above. Under these circumstances they can remain below for a length of time varying from an hour to a few minutes, depending on the depth at which they are working. The best sponges are obtained in this way, as they are more perfect and of larger size in deep water, and can be removed from the rocks with greater care.

Dredging is also practised off the coast of Asia Minor.

Sponges are prepared for the market by first exposing them to the air until the animal matter begins to decay. They are then washed, either by beating, by treading them with the feet

or by exposing them to the action of the waves in so-called "crawls" or pens, until the skeletons are entirely freed of animal matter. They are then hung up to dry, baled, and sent to the market. Sometimes sponges are more quickly prepared by being bleached with chemicals. This gives them a very light color but impairs their quality. Sometimes when sold by weight they are adulterated with sand.

Sponge-fishing has been carried on so unwisely and with so little thought [for the future, that the supply has been steadily declining in recent years, and lately the governments of the various countries concerned, foreseeing the almost certain destruction of the sponge industry, have attempted to regulate it in various ways and also to increase the supply by artificial propagation.

In Florida and Italy, more or less successful progress has been made, especially in the matter of sponge propagation. This is done in the winter season by choosing uninjured specimens and cutting them up into fine pieces about an inch square, on a board kept moist with sea-water. These "cuttings" are then placed on the ends of sharpened stakes held upright in a weighted wooden framework. This is sunk in a sheltered bay with a rocky bottom, free from mud, and protected from cold currents. If properly treated in this manner sponges will treble their size in a year and will be ready for the market in from five to six years.



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